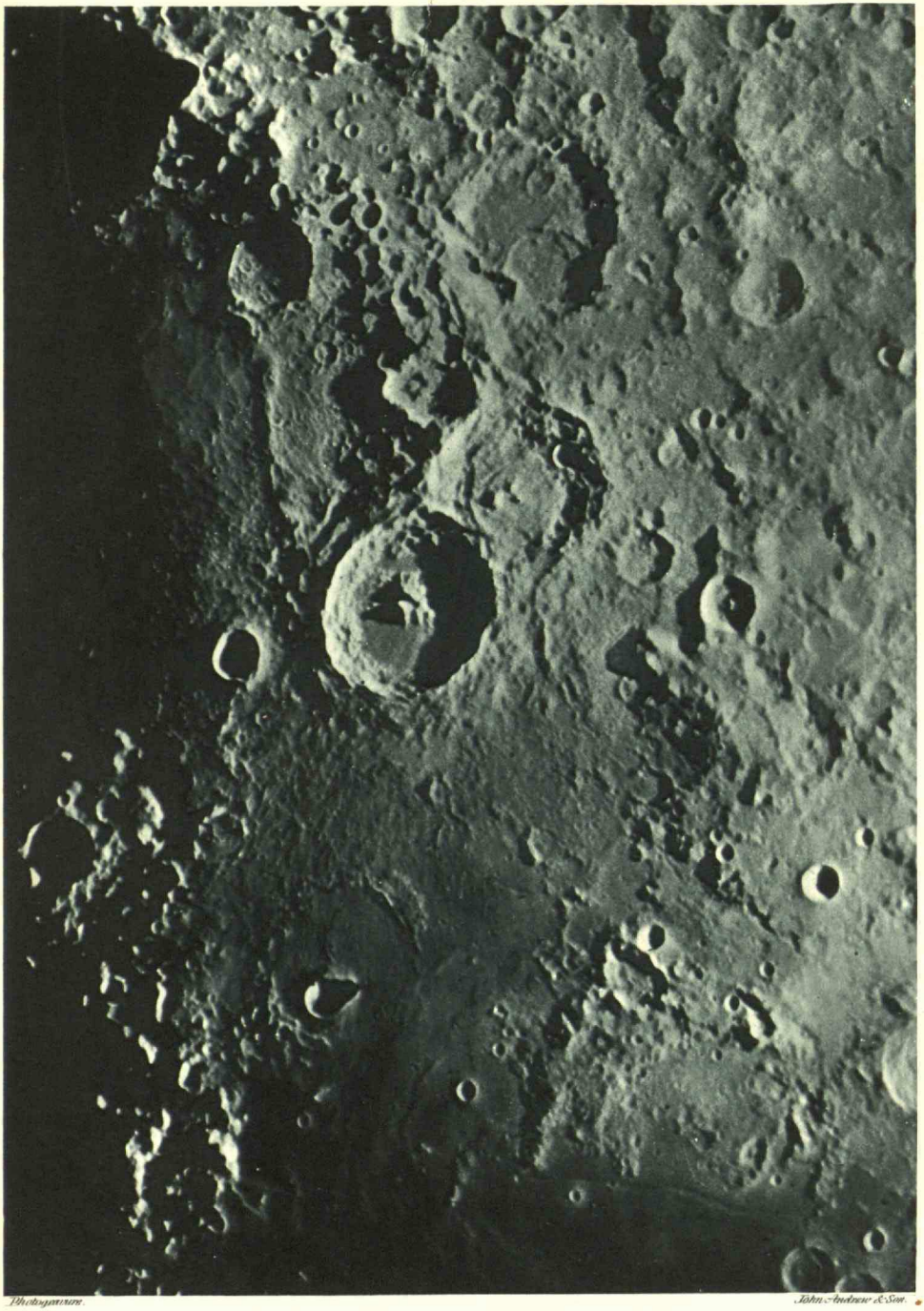

LUNAR CRATER THEOPHILUS.

Photographed with the Great Yerkes Telescope.

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EDUCATION FOR COMMERCE

The old century was born amidst days of marvellous mechanical inventions which enormously increased the production of economic goods. Commerce, to be sure, expanded throughout the last century; but the distinctive note was production,— penetration into the secrets of nature, and the use of natural forces hitherto unharnessed, to do effective work for the comfort of the human race. What the final economic significance of this century will be, it is useless to conjecture; but at its birth we are certainly witnessing an expansion in industrial organization and international exchange which must, at least, enkindle the imagination of every observer of economic affairs. Does this movement have any significance for education? Does it justify the introduction of special curricula, in order to meet new demands?

Education at the beginning of the last century was almost exclusively for the benefit of the ruling and professional classes; here and there a wider responsibility was recognized, as in the United States; but even here education was primarily to secure a better citizenship and to withstand the more valiantly the temptations of that "old deluder, Satan." The industrial activity of the last century after much educational controversy led in turn to the estab-

lishment of special schools of manual training, trades, mechanical arts, engineering, and agriculture, so as to be able to utilize more effectively the new productive instruments. These schools have had to struggle for recognition, and have only gradually won an honorable place. Manual training was said to be a prostitution of the real ends of education; and it was absurd to suppose that a student could be educated for the shop or for an engineering career within the walls of a class-room of a school. Nevertheless, the dignity of the new education has been slowly but increasingly acknowledged; and the practicability of a preparatory training outside of the machine-shop has been admitted by the most crusty and conservative defenders of the older system of apprenticeship.

Is there any analogy in this experience which may be applied to the more recent developments of economic life? There are two questions to be considered: first, Is a commercial education needed? and, secondly, Can such an education be provided through the agency of an educational institution? In regard to each of these inquiries there is considerable scepticism even among business men. The answer consequently demands careful reflection. It will be impossible in this place to consider the whole range of commercial education through its several grades; and I shall therefore confine my attention to one particular portion of the subject,— to that part, however, in regard to which there is the greatest amount of perplexity and doubt.

A recent report of a sub-committee appointed by the Technical Education Board of the London County Council points out that the commercial classes may be divided into three groups of persons, performing very diverse functions, and, consequently, needing very different educational opportunities. These are: (1) the general class of office

boys, junior clerks, shorthand clerks, copyists, and book-keepers, who are engaged in operations which are largely mechanical; (2) employees in more responsible positions, correspondence clerks, managers of departments, agents, dealers, and travellers; (3) the great employers of industry and heads of large firms and business houses. Here, also, may be included the experts employed in government positions, national and municipal, and commercial attachés engaged in consular service. The proper education of the first two of these classes is for the present passed by, and will not fall within the scope of this brief paper. My inquiry is limited to the training of the third group; that is, the commercial education of a collegiate type for youth from eighteen to twenty-one or twenty-two years of age.

First, then, is a special education for those who hope to reach a high mark in the commercial organization needed? Is there a special education which will be helpful to the commercial cadet in overcoming difficulties, in lessening wasteful effort, and in gaining the desired promotion? When it is seen that thousands of young men leave the college or university and enter upon commercial life without any such special preparation, and achieve a certain measure of success in the business world, many are disposed to answer these questions in the negative. Business, we are told, is a comparatively simple matter, requiring first of all certain moral and personal qualities, as honesty, industry, shrewdness, and tact. Given these, the young man who has learned to handle his powers, and who possesses an intuitive business knack, can best pick up in the counting-room or "on the road" the professional knowledge which is required for success. In the past there may have been some truth in this reply, but observation shows that the change now going on in the commercial organization is so great that this older answer must now be modified.

Goods are produced to be consumed. It was formerly, for the great proportion of exchanges, an easy matter to get the goods, when once produced, into the hands of the consumers. The producer and the consumer were economic neighbors. They lived in the same community or district, and easily adjusted the exchanges which they wished to make. The exceptions in exchangeable goods were for the most part luxuries and certain staples of raw materials. It needs no extended illustration to show that the distance between the producer and the consumer is growing greater and greater. Commodity after commodity is being swept into the great world current of commerce and exchange. A knowledge of the world's markets, the geographical distribution of raw materials, the methods of communication, the commercial customs of different countries, and the governmental restrictions which are imposed thus become more and more important. This is no fanciful statement. It is the burden of every message which comes back from the consuls of every nation. And, if we turn our eyes to industry which is not concerned with foreign markets, we find the entrepreneur involved in a network of intricacies. Formerly the commercial success of the manufacturer depended largely upon the moral qualities referred to, plus the possession of some capital with which to erect a plant, upon purchase of raw materials, and hiring of labor near by, and, finally, upon the display of shrewdness and enterprise in selling the product.

These conditions, however, are departing. Business is being technically organized on a larger and larger scale. The corporation is taking the place of the individual or the simple partnership. The industrial unit is an assemblage of sub-departments, each of which must be fitted with nice precision into the whole, so as to secure the greatest economy

of effort. All this presupposes a wider range of specialized knowledge; and, in addition, what is, perhaps, of more importance yet, this knowledge must be applied promptly and decisively. An error in moving this or that pawn on the commercial chess-board means disaster. Business no longer allows that dilatory procedure which our forefathers enjoyed in planning their commercial ventures. Here, again, we may find an analogy in the field of mechanical development, in the decay of apprenticeship. Apprenticeship has become an anomaly or an impossibility in the large factory or shop. And, as it has become more and more impracticable for the son of the manufacturer to learn the mechanical processes and arts by working at the craft, so it is becoming more and more difficult for the son of the commercial entrepreneur to learn by experience the various facts which are requisite for confident leadership. The complaint to the writer by a successful manufacturer and exporter of machinery may serve as a single illustration: "I can hire young men, graduates of engineering schools, to go into the mechanical departments of my business; but I do not know where to turn to find a young man properly trained to come into my office who, by an appreciation of the problems which I have to face, can relieve me of a portion of responsibility."

Success, then, depends not only upon the possession of honesty, promptness, sagacity, and fierce activity, but also upon a knowledge of the economic and political forces amid which the individual business is now placed. This leader must know something of the new legal status in which business is framed,— that is, the corporation,— the methods of its organization, its capitalization, its restrictions, its responsibilities, and its opportunities; of local taxation, increasing in its varieties, and which is becoming every year of more vital importance to the manufacturer; of banking and

credits, ever increasing in technical elaborateness; of transportation, which as a single factor oftentimes makes or ruins an industry; and, finally, of the position of labor, its methods of organization, its demands, and the experiments by which the friction between the employer and the laborer has been reduced. All of these are practical questions. Whatever theory the business man may hold as to the ideal solution of these problems and whatever he may think as to the wisdom or foolishness of economic theory, he will run up against a "condition"; and the knowledge of this condition must necessarily help to prevent loss or ultimate failure. One of the reasons why the trust formation of business in recent years is being so generally seized upon is that the individual does not have the needed wisdom and skill to meet the new conditions. He has felt the necessity of a refuge in a combination where numbers will be a supporting strength.

The second question concerns the practicability of providing, in an educational institution, a young man of college age with a knowledge of the subjects referred to. Here it is necessary to dismiss peremptorily any suggestion that a student can be made an entrepreneur by college training. No more can an engineer or an architect be made within a college or school of technology. The young man is graduated a Bachelor of Science, but the attainment of the more special title depends upon the personal equation and practical experience. The school can only prepare the student for commercial life as it prepares the student to be an engineer. The details of this commercial education must be worked out by experience; and, while no clear answer in regard to the exact character of a curriculum can be given, there need be no discouragement when it is remembered that the difficulties which faced engineering education thirty

or forty years ago in this country were very great. There was then no agreement as to what subjects should be taught; and, as for text-books, they had to be created from the slow accumulation of class-room notes. Engineering education as it is found to-day has been a matter of growth and experiment. It must be the same with commercial education; but, at the outset, without any desire to pre-determine the entire character of such a course, the following topics may be suggested: —

In the first place the student should be informed in regard to certain commercial processes. Here may be included: —

(*a*) Accounting, including the theory of book-keeping and the reading of accounts of manufacturing, banking, railway, and municipal corporations. To this should be added exercises as to the practice of audit.

(*b*) Systems of weights and measures of different countries.

(*c*) Coinage and banking systems in the United States and in the principal countries with which the United States carries on foreign trade.

(*d*) The theory of domestic and foreign exchange, including arbitrage.

(*e*) Nature of notes, stocks, and bank securities, considered as investments or as collateral for credit transactions.

(*f*) Produce and stock exchanges and their operations.

(*g*) Transportation, railway and ocean, including a consideration of the elements which determine the making of rates.

(*h*) Customs regulations of different countries, including tariffs and methods of bonding.

(*i*) The organization of capital either under partnership or corporate form.

(*j*) Descriptive accounts of systems of taxation in the United States and the principal countries of the world.

(*k*) Commercial statistics, the scope of consular reports and the reports of boards of trade and chambers of commerce, with some information in regard to the more important trade journals.

In the second place it should be observed that, although the young man whom we are especially considering is primarily engaged in distributing goods, his interests are most intimately interlocked with the producer in the field of manufactures. It is essential that he should be able to talk intelligently with his associates who are engaged in the more distinctively productive processes in regard to problems of common interest which will inevitably arise in the successful carrying on and development of a business enterprise. To meet this need, he requires to be instructed in regard to the nature of machinery and the chemistry of the more important industrial products.

It is not to be supposed that the student will proceed far enough, in either of the lines referred to, to justify undertaking, as an expert, either engineering or chemical work. It is desirable, however, that this business man whom we are considering should be able to understand the different elements of machinery, should appreciate the relation of different parts of an engineering plant, and should be competent to read a machine drawing. This would require a course in mathematics, including a portion of the calculus, projections, and as much descriptive geometry as would be requisite for an elementary course in mechanism. A brief course descriptive of engines might also be added. On the side of physics and chemistry it is desirable that this student should have special work in industrial chemistry, which

would include the discussion of such topics as illuminants, lime, mortar, and cement, building stones, paints, varnish, oils, explosives, gas, and electro-metallurgy. It is because of these needs, as it appears to me, that this new commercial education can best be given in institutions where there is a generous provision for engineering and scientific instruction. Several colleges now undertaking so-called Commerce Departments are, I believe, making an error in placing the emphasis almost exclusively upon the economic and political studies. The commercial leaders, at least many of them, must be trained in science; and for this reason the scientific school has an obligation and responsibility which it should not shirk.

A third special department of study should include the field of commercial products and geography. Instruction should be afforded in the distribution of raw products throughout the world; and particular emphasis might to advantage be placed upon the products of the Latin-American republics and countries with which the United States is developing an export trade. Great weight should be given to this instruction. It could well cover two years of time. It should be detailed, and might become one of the culturing studies of the course, as well as an articulated portion of a professional education. In manufactured goods there should be a course of descriptive lectures in regard to the leading manufacturing industries, iron, cotton, wool, and leather.

These topics represent some of the more distinctively technical subjects of a commercial character which may be regarded as common to all kinds of business. Nothing is here said about the advantage of a knowledge of history, international and commercial law, or modern languages. Of

these, and of studies of general culture, there should be as generous an amount as time affords. The course, however, should be specialized and professional in the same sense as courses in civil engineering, architecture, or chemistry. The methods employed should be precise and disciplinary. For some of the departments of instruction, specialists would have to be brought in from the active business world. In particular there would be required experts in banking, export trade, railway management and finance, and commercial law.

In the final curriculum offered there should obviously be an opportunity for following out special branches of business. The commercial side of railway management, the profession of banking in the larger sense which is so intimately associated with the establishment of new companies, and the business of exporting, all present attractive fields for specialization. The varieties of business are many, and the details must be learned by actual experience. The youth, however, who has a taste for commercial affairs, and who devotes himself persistently to a curriculum which includes the studies suggested, will not only find his way made easier, his progress more rapid, but will be able to contribute a large measure of benefit to the better solution of the troublesome problems of business organization.

DAVIS R. DEWEY.

ANNUAL DINNER OF THE ALUMNI

DECEMBER 29, 1900

RESPONSE OF HON. JOHN D. LONG, SECRETARY OF THE NAVY

Personally there is no reason why you should invite me or I should accept your invitation to speak to the alumni of the leading technical school of the country, unless it be that, as a citizen of this Commonwealth, I may congratulate the Massachusetts Institute of Technology upon the acquisition to its Presidency of my friend Mr. Pritchett. He began his career in one of the scientific departments of our naval organization, which, of course, is the best guarantee of a good training. A flash, therefore, of the halo of the present glory of the Navy hovers about his head. After years of good service in the University of St. Louis, and more recently as the efficient chief of the Coast Survey, he now comes to Boston thoroughly equipped for the great post to which he succeeds. As one who has been associated with him in Washington in the general administration of the government, I bring most cordial testimony to his fitness and promise.

Addressing you in any other capacity, I am as a child talking to his elders. I have not even a smattering of technical knowledge. When I graduated at Harvard, this Institute had no existence. Since then there has been a revolution in education from the classical to the technical. It is not that the old education is obsolete. It gave us and still gives us the training for the statesman, for literature, for the press, and for the tremendous influence that goes with the written and spoken word. But the demand of the time, the tremendous achievements of inventive genius and mechanical skill, have made necessary this co-ordinate education of the genius of construction. I can at least, though not of this school, look with admiration and gratitude upon its great results. I recognize it as a part of the abounding education of the people,—an education which fits them to make the forces of nature the servants of their convenience, and to carry on the work of the world's development.

Booker Washington tells us of his struggles to divert his people from the ambition to do nothing but read a book, and to turn them to the earning of their living by the cunning of the hand. What he is doing for his race, we are doing for all. We are entering

upon the coming century, therefore, equipped on all sides. The old college and the new institute are turning out men prepared for the inestimable opportunities which it will offer for beneficent results in human living beyond the imagination to conceive. With the utmost modesty, therefore, I pay my respects to the men who constitute the advance-guard.

I was asked the other day by a newspaper — even your greatest mathematician, though he can measure the distance from the earth to the sun, cannot calculate what a newspaper will ask — to name the ten men who, in my opinion, have done most during the nineteenth century for the welfare of the people. It is one of those questions which nobody can answer. It is like asking a college boy which is the most promising boy — I beg pardon, I should say man — in his class. It takes fifty years to tell that, and the final selection very likely falls on the last man that would have been thought of in college days. It needs the perspective of centuries to point out, looking backward, the tops in any one century. You can count upon your fingers the great names in the centuries just before and after Christ. You can easily name most of them in the centuries as late as the seventeenth or eighteenth. But in our own they crowd you to distraction. However, I made the attempt, so far as our own country is concerned. But what I am coming at is this: that I found myself passing over the men of letters and the statesmen, and making my list mainly from the great inventors,— Fulton, Morse, McCormick, Edison, Morton, Howe. These are the men who have lightened toil, who have brought comfort, convenience, easier ways of living, and made practicable the enlargement of commerce; who have made us one people, neighbors, and friends; who have enabled the soil to feed our teeming millions; and who have made possible the immeasurable wealth of the country, and its distribution from its reservoirs into every home in the land.

But the thought went further. Great as is their desert, is all the praise due them alone? Whence came the invention? Was it from the brain of Fulton or Morton or McCormick alone, or did it come from the accumulated and preceding scientific knowledge of which they availed themselves? Was not theirs simply the taking of a step, up to which technical and scientific investigation had already led? Hardly one of them can be named who was not working in a field in which others were also at work. One of the most significant things in human life is that all lives are interwoven, that all thought is interchanged. There is no limit to the extent

of human genius and search for truth. It is this element in human nature which the technical school to-day in its splendid development is serving. There were eyes that watched the play of the lightning before Franklin, there were boys that studied steam from the nose of the teakettle before Watt; but there was no institute to which they could turn for aid.

To-day every year brings within your walls large and increasing classes of the brightest and keenest minds, eager for scientific research, quick to reduce theory to practice, soon to aid in this great work of utilizing every force in nature, every element in the air or sea or earth, putting them to the use and convenience of mankind. What a magnificent future is before them! Undoubtedly, as always before, it is only one here and there that will have the rare distinction of having an immortal name; yet none the less will they all deserve the credit. It is the association which they form, it is the atmosphere which they create, it is the common movement in which they advance, which will carry them forward to victories for peace, for civilization, for humanity, for the golden age that yet shall be.

No, you have not invited me personally. You have invited me as the representative of the Navy. And you invite me in this capacity, not because the Navy is a fighting organization, destructive of human life, but because to-day it requires in its officers and men just that technical education which you give, and represents just those technical results which you seek. It is in this respect that they are one with you fellow-students and workers in practical, scientific, and technical work. It may strike you then as a little incongruous that a man without technical knowledge should be at the head of the Navy Department. No more so, perhaps, than that in former days, when the Navy did not have this technical character, its head was always a man who had never gone to sea or smelt powder. The Secretary of the Navy is usually wise enough to know that his proper course is to leave the special features of his department to the men who are especially qualified to direct them.

If I may speak of my own experience, I have made it a point not to attempt to master the details of naval construction or electrical power or steam engineering. I have known that a little learning is a dangerous thing; and, while it might not make me mad, it might lead me into sloughs where I should only flounder. My theory has been in each Department to keep the trained man at the head, to give him full power, and to hold him always to the fullest responsibility. I believe the result justifies the confidence, and that

the American Navy to-day commands the confidence of the people for its efficiency, not only in battle, but in all the infinite variety of its technical work.

I do not lightly estimate the kind words which have been spoken of the success of the Navy under my administration; and frankly, and in no spirit of false modesty, I never let the occasion slip of saying that that success is mainly due to the men who, as the heads of the Bureaus of the Navy Department and in command of its ships and posts, have first made thorough preparation for every emergency that has arisen, and have then met and discharged it,— technical men and graduates, if not of the Massachusetts Institute of Technology, of the technologic institute of general construction, engineering, and mechanical and professional experience.

In this connection let me say that the technical schools of the country are very close to the Navy Department, and must continue to play an important part in the successful development and construction of the Navy; for it is to these schools that we look for recruits to supply the posts of direction and responsibility in the ship and engine building establishments of the country, which are now rapidly increasing both in number and capacity. I do not doubt that much of this rapid increase in our building facilities is due largely to the advance which has been made in technical education during the past twenty years,—an advance which has stimulated invention, taught us how to produce articles of manufacture more rapidly and at less cost than formerly and to transport them at such low rates that we are now able to compete with our European competitors for the trade of the world.

The need of such technical education as is given by the Massachusetts Institute of Technology is greater to-day in naval architecture and marine engineering than ever before in our history. Twenty years ago the designers of our ships and machinery were content to make the various parts of the structure of the hull and engines almost as heavy as they were then made in vessels of the merchant marine. But, as the demand for high speed increased, it soon became apparent that we must not only keep pace with other nations, but, if possible, do even a little better; and I think that I do not overstate the case when I say that to-day our ships are certainly not inferior to those of foreign powers. This rapid advance has been brought about largely by the technical education of our officers, ably seconded by the staff of the great ship-building establishments of the country, without whose active co-operation it would not have been possible.

I think that I can best illustrate the advance that we have made during this period by drawing a comparison between two vessels of almost the same size, one the "Atlanta," designed in 1882, and the other the "Denver," designed in 1899. These vessels are cruisers of about 3,000 tons' displacement, the "Atlanta" being of 3,070, and the "Denver" of 3,200 tons. Both have steel hulls; but the "Denver's" hull is sheathed and coppered, which will enable her to continue her voyage for longer periods without the necessity of docking. The "Atlanta" has horizontal, compound engines, driving a single screw that gave her a speed of fifteen knots. The "Denver" has vertical, triple-expansion engines, driving twin-screws that will give her a speed of more than sixteen knots. The "Atlanta" has cylindrical boilers that carry a pressure of 90 pounds of steam; while those of the "Denver," which are of the water tube type, will carry 250 pounds. The coal bunkers of the "Atlanta" were of 490 tons' capacity, and those of the "Denver" 700 tons', enabling the "Denver," on account of the more economical type of engine, to steam about 7,000 miles, or, practically, twice as far as the "Atlanta." Many other improvements have been incorporated in the "Denver" which the "Atlanta" did not possess, such, for instance, as the complete deck protection for the guns and the gunners, smokeless powder, and the almost complete elimination of all combustible material. Briefly, we have in the "Denver" a ship that will steam a knot faster than the "Atlanta," and go twice the distance; one that will be able to maintain her rate of speed for a very long time, while her predecessor will be constantly falling off in speed after docking; one the battery of which, though of smaller calibre, is just as effective as the other's against any vessel she will be called on to fight, and that can be served much more rapidly. Had we been content with giving the "Denver" the same coal bunker capacity as the "Atlanta," we could probably have given her a speed of at least eighteen knots.

The advance that has been made in battleship construction has been still more rapid; but I have selected the "Atlanta" and the "Denver" for this comparison, for which I am indebted to Lieutenant Griffin, because we had no large ships twenty years ago.

While the credit of this advance is due in a large measure to the technical officers of the service, I feel sure that they will not be offended if I say that it would not have been possible to accomplish all this but for the active co-operation and material assistance of our great industrial establishments; for, while the contract for the ship as a whole is given to one firm, the work is scattered all over the coun-

try. The great steel establishments have given us better steel both for structural and protective purposes, enabling us to build more powerful ships and machinery with less weight of material than formerly, and to carry more powerful guns. The electrical establishments, always increasing in their capabilities, began by simply furnishing us with electric lighting apparatus. They now give us, also, the search light, the telephone, fire and water alarms and signals, and furnish us electric machinery for operating our turrets and their guns, for hoisting ammunition, and for less important operations on board ship. Even the chemist has been called upon to make us a better powder than we used to have; and so far has he been successful that now, instead of the smoke of our guns obscuring the enemy, as it did at Santiago, we are producing a smokeless powder which, our ordnance experts say, is superior to that manufactured abroad. The chemist had already taught us how to handle with safety gun-cotton and other high explosives, so that the success of our torpedo equipment is assured, and our automobile torpedo in the hands of the technical man has become not only an instrument of destruction, but also one of great precision. The submarine torpedo boat, yet in its infancy, has at last reached that stage of development where the government and naval officers consider that there are great possibilities in it, and think it well worthy of a trial.

If we compare a battleship, like the "Kearsarge," with one of the old sailing frigates, like the "Constitution," we are struck with the wonderful strides that have been made in a century, and are more than ever impressed with the obligation we are under to the technical man who has been so largely instrumental in bringing about this transformation. Instead of a wooden hull with spars, he has given us the mastless steel hull, protected with the most impenetrable armor that human ingenuity has devised; instead of sails, giving us a speed depending upon the strength and direction of the wind, he has given us powerful steam engines and boilers, operating twin screws that give a speed which our forefathers never dreamed of, and as certain of attainment as is the speed of railway trains; instead of the low-powered cast-iron, smooth-bore, muzzle-loading guns of small calibre, he has given us the high-powered steel, breech-loading rifles and rapid-fire and machine guns, which belch an incessant fire of deadly missiles, and which wrought such destruction to the Spanish fleets at Manila and at Santiago; instead of having to depend upon manual power for the performance of all operations on shipboard, he has given us steam-engines and electric motors that reduce the actual manual operations to a minimum, and render

their performance a matter of seconds where formerly minutes were required. Turn where you may on board a modern ship, and you find evidences of the ingenuity and the resource of the technical man; for where space is so valuable as it is on shipboard, and where the importance of making everything as light as is consistent with safety and durability is paramount, there is scope for the greatest display of skill.

This change in the character of our ships has brought with it a marked change in the character and training of our officers and seamen. It may truly be said of the naval officer of the day that he is a technical man of the highest order; and, of the seaman, that he is fast becoming, if not a mechanic, at least a man familiar with the manipulation of mechanical appliances, and to such a degree that the successful operation of our ships bears constant testimony to his skill. To such an extent has the application of modern science and engineering been carried in the vessels of our Navy that to any but a man of technical education and training it seems almost incredible that such vast machines should be so successfully handled as our ships are.

The introduction of such immense machines as the modern battleship has brought with it the necessity for the presence, with a fleet operating away from our coast, of a repair ship; that is, besides the machine-shop found in all our large ships, and capable of doing the minor repair work that is always in evidence, the presence of a ship fitted up with the most modern tools and appliances for handling heavy work, and capable of making the fleet absolutely independent of foreign dock yards. In this repair ship we have a well-appointed machine-shop, foundry, and forge, with tools of the most modern construction for the rapid repair or construction of any parts that may become disabled; for, although the technical man does try to make everything strong enough, there are times when a hidden flaw makes work necessary which cannot properly be charged to wear and tear, and it is here that the repair ship comes in. We equipped such a ship on a comparatively small scale during the Spanish War, and the testimony of our officers who were at Santiago is that she was invaluable.

While I have thus dwelt upon the relation of the technical school and its offshoots, or its results, to the material of the Navy, I am none the less impressed with the obligation we are under to these schools for the training they are giving the young men who may in an emergency be called upon to assist the officers of the Navy on board ship in time of war. This was exemplified during the Spanish

War, when the Engineer Corps of the Navy was temporarily increased by the appointment of a large number of Acting Assistant Engineers, who were distributed among the large ships of the fleet operating along the coast of Cuba; and it gives me pleasure to bear testimony to the efficient manner in which they performed their duty, and to their fidelity to the trust that was imposed upon them.

That the Navy Department is not unmindful of this obligation of the government to the technical schools, and its dependence upon them, is testified to by its cheerful compliance with requests for plans and specifications of our ships and machinery, and for general information of a technical character that can properly be given out. That the government itself has not been unmindful of the importance of such schools appears in the foresight of Congress, which by its land grants did so much for the education of our youth in technical matters; and I am glad that the Massachusetts Institute of Technology was one of the colleges to benefit by this measure, and is now repaying the benefaction in a tenfold return to the whole people, of whom Congress is only the representative.

Is not all this, after all, only another exemplification of the brotherhood of man, the kinship of human genius, the co-operation of all hands and hearts in the common advance of the race, and in evolving the larger, mightier, happier, and, may I not fervently pray, the better life? You celebrate to-night your Institute,— the triumphs of mechanical skill, the progress of the arts. But more — and thus you fitly join the rest of us with you — you celebrate the mastery of the human mind, its sovereignty over the earth and its uplift to heaven. Not the poet,— yes, the poet of the coming centuries, some alumnus of the Massachusetts Institute of Technology, will yet some day, as an engineering diversion, actually pile Ossa upon Pelion, and snatch the thunderbolts from the hand of Jove.

OUR COMMERCIAL EXPANSION

RESPONSE OF HON DAVID J. HILL, ASSISTANT SECRETARY OF STATE

Among the notable phenomena of the century through which our country has just passed is the complete inversion of its economic condition. In the year 1800 the great need of the United States was for capital with which to develop its wonderful natural resources. In the year 1900 a superabundance of capital is demanding new fields of profit in which it may reap its natural reward. Then the primeval forests, the untilled prairies, the unopened mines, the incipient or untried industries necessary to a harmonious economic development, were crying aloud for men and money to open their vast treasuries of latent wealth. Now the congestion of capital in the great cities creates a still more difficult problem, and the hard-earned economies of years beg for investments which will yield an adequate return for the support of old age. Then our country welcomed the advent of strong hands eager for remunerative toil, and especially the arrival of money to swell the meagre currency and serve as the instrument of enterprise. Now organized labor, anxious to preserve its patrimony of opportunity, discourages fresh immigration; and unemployed capital looks with disquietude upon competition in the money market, turning its gaze inquiringly to distant parts of the world in the hope of finding a safe and remunerative field for increase.

Two great agencies of change have wrought this transformation: (1) the application of mechanical power; and (2) the creation of a new mechanism of credit.

During the whole of the past century the forces of nature have been gradually substituted for the power of human muscles, and ingenious devices have been invented to direct these forces toward the accomplishment of results hitherto impossible. The problems of mechanical production and transportation have been solved to a point of perfection where the supply of finished products, placed where they are most needed, has ceased to be a subject of serious importance; and in its place has arisen the new and more serious problem of finding an adequate demand for labor and capital. Machines, factories, railroads, and internal steam navigation have completely transformed the conditions of life in the United States, as they have in Europe; and to-day the question is not, as at the beginning of the century, What shall release us from the doom of being forever a merely agricultural nation, exporting the riches of

our soil and importing the chief products of industry? but, on the contrary, Where shall we find adequate markets to absorb the enormous output of our looms and forges and manufactories?

Along with this unparalleled mechanical development has arisen the modern system of banking, by which credit has been created and the mechanism of exchange brought to comparative perfection on its financial side. We still measure values by the precious metals, but they have been discovered in such abundance that we may now employ with advantage only one of them as a monetary basis. We have learned that it is not necessary to use the standard of value as an actual medium of exchange, and that it is in every way expedient to abandon that survival from the era of mere barter, and to substitute for it the guarantees afforded by well-assured credit. In consequence of this discovery, ninety-five per cent. of our enormous business transactions are carried to completion by the employment of credits on the books of banks, without the use of even credit currency; and it is only in times of uncertainty or apprehension that we prefer metallic money to mere paper promises to pay.

When we compare our economic development with that of European nations, we perceive that our undivided attention has hitherto been directed toward the building up of our domestic industries, satisfied to supply the wants of our own people, and impressed with the gigantic task of developing the vast resources of that part of the continent which is our national heritage. But recent events have carried our thoughts beyond our own borders, and far out over the two great oceans which constitute our eastern and western boundaries. Our recent experience has been the fruit of conditions unforeseen, and not the pre-determined policy of either statesmen or economists; yet, opening our eyes upon our actual surroundings, we find ourselves in proximity, in the West Indies and in the Pacific, to what is still left of the undeveloped markets of the world.

We have, since the Spanish American War, come to a new consciousness of our position and opportunities upon and beyond the sea. The thrilling exploits of our navy have recalled the heroic days of John Paul Jones and the gallant sailors who carried war and terror into the very harbors of the British Isles when we were only revolting colonies. The splendid test of our naval construction and the superb equipment and management of our fleets, under the direction of that noble and masterful son of Massachusetts, the present Secretary of the Navy, have proved to ourselves and to all

the world that American ship-building and seamanship have no superiors, and that, like our ancient Norse ancestors, we have nothing to fear upon the sea, whose stormy pathways lead to every land and open to the fearless voyager the possession of the earth.

Nothing but our vast continental opportunities could ever have retarded our maritime development. Indeed, for more than fifty years after the Revolution our merchant marine continued to increase even more rapidly than our domestic industries. In 1830 De Tocqueville wrote, "The Americans themselves now transport to their own shores nine-tenths of the European produce which they consume, and they also bring three-quarters of the exports of the New World to the European consumer." "Nations, as well as men," he continues, "almost always betray the prominent features of their future destiny in their earliest years. When I contemplate the ardor with which the Americans prosecute commerce, the advantages which aid them, and the success of their undertakings, I cannot help believing that they will one day become the first maritime power of the globe. They are born to rule the seas, as the Romans were to conquer the world."

But, with the opening and development of the great North-west, our countrymen found a vast opportunity for the display of their maritime instincts in the unsalted inland seas that stretch for a thousand miles from New York to Minnesota, and upon the great waterways of the Mississippi and its tributaries; and thus the shipping industry of the Great Lakes and the Western rivers became greater than that of our Atlantic seacoast. In 1850 the domestic steam tonnage of the United States was more than double the steam tonnage of the British Empire, while that of American vessels registered for the foreign trade was about one-fourth of the entire imperial steam marine. But during the progress of our Civil War, Great Britain more than doubled her steam tonnage, which in 1860 was still less than that of the United States; while in 1890 it had grown to a proportion of superiority represented by four to one. The progress of Great Britain's mercantile marine and our own preoccupation in domestic strife and rehabilitation have placed us more than fifty years behind in maritime development, with the result that to-day only 9 per cent. of our exports and imports are carried in American ships.

While we have been diverted by internal occupations, our foreign carrying trade has passsed into other hands, and not only into those of the great island empire which so naturally claims the dominion of the ocean, but into those of another power whose entire coast

line is limited to less than one hundred miles of the North Sea and about five hundred miles of the Baltic. From her two great ports of Hamburg and Bremen, Germany sends her powerful steamships into every port of the world; and Americans going to South America cross the Atlantic, in order to sail to Brazil and the Argentine Republic from a German port. "Here, as everywhere, the German steamship companies are acting as the pioneers of German trade by supplying direct and regular channels of communication." And thus, upon our own continent, we are losing, not only the legitimate tolls of transportation, but the rich markets that would reward our labor and capital.

And yet we are not only the possessors of both Atlantic and Pacific islands, but supplied with materials and skill in ship-building which attract Japan, Russia, Turkey, and other powers to our shipyards, to enlarge their fleets with the most modern equipment. Said the queen regent of Spain to an American diplomat, before the outbreak of the late war with Spain, "I understand that in the shelter of your great rivers you could, undisturbed by coast attacks, build and launch great navies to surpass any in the world." Yes, it is true; and in those same rivers we could build the peaceful messengers of trade, carrying, instead of deadly instruments of destruction, the products of our farms and our factories to gladden all the needy peoples of the globe, and fill our homes on their return with the distinctive products of other lands.

Great Britain finds the strength of her empire in her ships and colonies, while Russia possesses greatness in the extent of her continental domain, whose vast interior is forever safe from a foreign foe. The United States joins all the potentialities of both advantages in the combination of the longest and most varied coast line of any nation with a continental area immense, diversified, and facing both the great oceans of the earth. When these two oceans are connected by an isthmian canal, under American control, with insular outposts in the West Indies and the Pacific, every element of safe and prosperous existence will be united in the strategic position of this country for both peace and war.

Why, with abundance of capital seeking investment, with every natural advantage for successful competition, do not the American people build up a great merchant marine on the Atlantic and the Pacific, enter into their natural heritage of enlarged trade with South America, which they have actually suffered to diminish, and press forward into the great markets which a near future must open in the Far East? It is, undoubtedly, because of the uncertainty

whether or not this exertion would reap an adequate reward. Our foreign carrying trade has been so long neglected it may seem to many that we are permanently out of the race. A more courageous position would be that we can enter into this field by means similar to those we have employed in building up all our industries, namely: (1) a more perfect adaptation of mechanical power; (2) a better combination of our facilities of competition; and (3) a generous supervision by the national government.

It is well understood that the evolution of transportation, like that of other forms of industry, has proceeded along the line of constant mechanical improvement. It is, perhaps, a positive advantage, therefore, for a nation to enter the lists of competition late, because it is thereby enabled to create a plant that will surpass in efficiency and economy those of its competitors who are embarrassed with old means and old methods. While Great Britain has had millions of capital locked up in vessels of ancient type and impaired efficiency, Germany has come forward with the most improved steamship construction, and is actually forcing her established rival to rebuild her merchant fleet. American genius and skill now have their opportunity to contribute to the further improvement that may still remain to be made in naval and marine architecture; and such a great technical school as that represented here to-night should enter with enthusiasm upon the task that undoubtedly awaits the awakening enterprise of our people.

But a successful merchant marine depends less upon its own efficiency than upon the conditions with which it has to deal. The currents of established trade are stronger than the invisible streams that plough the ocean and have so long determined the paths of navigation. Where trade relations are fixed and established, it is difficult to effect innovations. Quite contrary to nature, which seems to ordain an exchange of products along lines running north and south and traversing the different zones of natural production, the paths of commerce on the Atlantic have hitherto chiefly run east and west. It is because these are the lines connecting the old and the new in the development of the world's civilization; and, when the old luxuries can be afforded in the new home, they are naturally imported from the mother country. Thus the trade of South America, for example, is not with North America, but with Europe. Yet this, while a historic, is not a natural relation, and need not be permanent. Still, custom, race, prejudice, and many other factors enter into the problem of diverting the course of trade; and to deflect it will require studious adaptation to local and racial peculiari-

ties, as well as absolute superiority of merchandise at equal or lower cost. Here is a field where producers have much to learn; and until American enterprise is aroused to this aspect of our foreign commerce, and the peculiar tastes as well as the actual wants of foreign peoples are seriously studied, the volume of foreign trade cannot be rapidly increased.

But the problem that lies before us is too great to be solved, or at least to be solved most speedily and effectively, by merely private enterprise, which requires a certain amount of public encouragement and direction. How, then, can the national government aid in opening these new fields for the employment of American capital and labor?

A ready answer to this question is, by making the development of a mercantile marine a subject of national interest, opening highways upon the ocean as we have opened them upon the land; for, when the road to market is shortened, private enterprise will do the rest. As other American industries of public importance have been promoted by national protection, so may the extension of ocean transportation; for it is the logical completion of that industrial development by which we have risen to the height of a great exporting nation. Our commercial independence will never be fully attained until American ships, sailing under the American flag, secure the direct and uninterrupted connection of the American farm and factory with the great markets of the world.

But there are other ways in which the generous supervision of the national government may promote the growth of our foreign trade and the success of ventures upon the sea. In every great European state the national superintendence of commerce has developed into a special form of public ministry, and henceforth the department of commerce will rank with the most vital organs of national life. In order to compete with other nations in the fierce rivalry of trade, every modern government requires a permanent staff of commercial experts, presided over by a competent economist of cosmopolitan attainments and able to assist the industrial and commercial energies of his countrymen with official information. The most intricate and difficult of all modern international conventions are the treaties of commerce, which cannot wisely be intrusted to mere international lawyers or statesmen or to ordinary diplomatists, but demand the wide erudition and expert skill of trained specialists in the science of trade.

The ideal organism for promoting international trade relations is a Minister of Commerce presiding over a competent body of

consular officers, acting as sense-organs to perceive and report existing conditions of trade in every part of the world.

At a time like the present, when every element of competing power becomes important, the condition of our consular service assumes a place in public interest analogous to that of the army and navy on the eve of war. The time has gone by when the business sense of the country will tolerate the idea that consular posts are to be used as health-stations for decayed politicians or as St. Helenas for political rivals. The cry of recent years has been for a radical reform of our consular system, and it has undoubtedly had its effect in securing a more capable and efficient *personnel* in the service than it has ever known before. Until recently this service has been so much the creature of chance that nearly all propositions have been true of it, or at least of individuals composing it. At present, the highest places are intended to be filled only by men of proved ability, those of the middle grade by appointees who have passed an examination before a special board of examiners, and the lowest by residents of good character in the places where salaried officers cannot be sustained.

The present defects of the system are the method of selecting the candidates and the uncertain tenure of office, from which result a great inequality in fitness for duty and much loss of time in acquiring the necessary experience. So long as consuls are appointed for political reasons, this must continue to be true; yet political partisanship is not a necessary disqualification for public office, and pre-eminent service to a party implies the ability to be of use to one's country also. So far as efficiency is concerned, therefore, it cannot be said that the service suffers simply because the appointees are partisans, but because the standard of admission is too low. The remedy for this is to raise the standard of examination and to extend it in some form to all consular positions, at least to the point of assurance that every officer possesses the essential qualifications for his post. As to the permanent tenure of office, that is too large a subject for discussion here.

Reaching out for a model upon which to reorganize our consular system, and accustomed to find many good things in Germany, some reformers have hastily adopted the current idea that the German system is so far superior to our own as to be worthy of our imitation. The truth is that the Germans, observing the business results obtained by certain American consuls, at present contemplate remodelling their own service in closer conformity with ours; for they find that the learning which our con-

suls lack, theirs possess in such embarrassing superfluity that they are better adapted by their training to become learned university professors than practical agents of commerce, for which they often feel contempt, and are so filled with a sense of official dignity that they frequently disdain to condescend to the lowly functions of a purely business office. What is needed for the equipment of efficient consuls is not an elaborate curriculum of professional study, but an intelligent knowledge of languages, a sufficient understanding of commercial and international law, and, above all, a practical training in some form of business which will enable them to comprehend the science of trade in its broader relations.

It is a significant augury of our future commercial development that, without system, without organization, without studied preparation, we are now able to compete with other nations in the great markets of the world. In 1898, for the first time in our history, our exports of manufactures exceeded our imports; and the new era of American commercial supremacy began. Our consular reports show that we are not only competing with Manchester in cotton goods, but sending iron to Birmingham, cutlery to Sheffield, silks and shoes to France, and beer to Germany! More than a thousand American locomotives are used in Russia, and are sent not only to China and Japan, South America and Africa, but to Spain, Italy, France, and even to England, where, it is said, "orders have been received for practically every railway in Great Britain."

And yet, notwithstanding our great capacity for mechanical construction and our immense superiority in land transportation, we are paying $500,000 every day for ocean carriage. But this anomalous condition cannot long endure. With surplus capital seeking investment, with materials of construction in abundance, with skilled labor of the highest order, we shall soon launch upon the deep great flotillas of commerce to bear our surplus products to every quarter of the globe.

COLLEGE ATHLETICS *

I trust it will not be deemed beneath the dignity of this occasion that I should ask your attention to a few thoughts regarding college athletics. No theme is to-day of greater consequence to the colleges and universities of our land, whether as influencing school discipline or as affecting the standard of scholarship. Alike those who applaud and those who deprecate the growth of athletics must admit the importance of the subject.

The past ten years have witnessed a remarkable development in the direction indicated, which we may well pause to consider. The rising passion for athletics has carried all before it. Thus far, at least, there is no sign of reaction or even of the exhaustion of the forward impulse. Honors in football, in baseball, and in rowing, have come to be esteemed of equal value with honors in the classics, in philosophy, or in mathematics; and, if the movement shall continue at the same rate, it will soon be fairly a question whether the letters A.B. in the college degree stand for bachelor of arts more than for bachelor of athletics.

Among instructors and the governing bodies of our colleges there is a wide difference of sentiment on the subject. Some applaud, some doubt, some disapprove: others are simply dazed and know not what to think, or suspend all judgment, waiting to see how much farther the rising tide will encroach upon the shore. In the larger community there is, perhaps, an even more pronounced divergence of opinion. Few college presidents or professors but see some good in the new movement, and sympathize largely with the enthusiasm of their pupils. But there is a host of editors, preachers, and men of affairs in the outside world, and a host of parents and guardians more directly concerned, who are sure that it is all of evil; that the colleges are simply going wild over athletic sports, preparing the way for the downfall of the traditional system of education. To many of these it is a monstrous thing that large bodies of young men should give themselves up to contests of skill and strength, and that larger bodies still should find in these contests the chief interest of their college life.

* In view of the choice of a gymnasium building as a Memorial to the late President Walker, it seems appropriate to republish his famous Phi Beta Kappa oration embodying his views on the subject of athletics. The reprint is, by courtesy of the publishers, from "Discussions in Education" (pp. 259 *et seq*). Henry Holt & Co., New York, 1899.

Fairly to approach the subject, we need to consider the state of things which existed prior to the war of secession; in other words, to go back just one human generation, as a human generation is usually computed. In those days, gymnastics held but a small, a very small, place in American colleges; while throughout the wider community there was almost no athleticism. The two most important exceptions to the latter statement were found in the occasional outlawed and always disreputable prize fight, generally with some international complication, genuine or manufactured, for the sake of stimulating public interest, and in a small amount of rather poor, unscientific boat-racing. Almost no honor was then given to a young man because he was strong, swift, courageous, or enduring. The college hero of those days was apt to be a young man of towering forehead, from which the hair was carefully brushed backwards and upwards to give the full effect to his remarkable phrenological developments. His cheeks were pale, his digestion pretty certain to be bad. He was self-conscious, introspective, and indulged in moods as became a child of genius. He had yearnings and aspirations, and not infrequently mistook physical lassitude for intellectuality and the gnawings of dyspepsia for spiritual cravings. He would have gravely distrusted his mission and his calling, had he found himself at any time playing ball. He went through moral crises and mental fermentations which seemed to him tremendous. From the gloomy recesses of his ill-kept and unventilated room he periodically came forth to astound his fellow-students with poor imitations of Coleridge, De Quincey, and Carlyle or of Goethe in translation.

Not all college heroes of those days were of this familiar type. Sometimes they were thunderous orators, more Websterian than Webster, who could by a single effort lift themselves to the full height of perorations which in the senate or the forum are the culmination of great arguments and of many a passionate appeal. Sometimes, though more rarely, the college hero was a delightfully wicked fellow, who did, or at least affected to do, naughty things, wrote satirical verses, was supposed to know life, and in various ways exerted a baleful fascination over his fellow-students. But, however the type of the college hero might vary, speech-making, debating, or fine writing, were the be-all and the end-all of college training, as in the world outside the college speech-making, debating, or fine writing were the sole recognized signs and proofs of greatness. Physical force, dexterity, and endurance, capacity for action, nerve, and will-power, went for little or nothing, so far as

public admiration was concerned. Statesmanship itself was perverted by eagerness to seek occasions for oratorical display. Men of business, men of affairs, men of prudence, moderation, and real ability, were crowded out of our legislative halls by shrill-voiced declaimers who could catch the ear of a nation given over to the lust of words. "Sir," once said Daniel Webster, bending those tremendous brows upon a young man afterwards renowned among the great attorney-generals of the United States,—"sir, the curse of this country has been its eloquent men."

What was the reason for this state of things regarding the college ideals of a generation ago, so strongly contrasted with what we see to-day? In part, bad physiology, or the absence of anything that could be called physiology, was responsible for it; but in greater part it was due, I believe, to the transcendentalism and sentimentalism of the last quarter of the eighteenth and the first quarter of the nineteenth century, which had created false and pernicious opinions concerning personal character and conduct. There was more than indifference, there was contempt for physical prowess. A man who was known to be specially gifted in this way was thereby disparaged in public estimation. If he were known to make much of it, he was likely to be despised. It was taken for granted that he could not be good for anything else. Brains and brawn were supposed to be developed in inverse ratio. Affected notions about intellectuality and spirituality had almost complete control of the popular thought. The only things to be admired were mind and soul. "Mere bigness" was a favorite phrase of contempt. Strength was believed to be closely akin to brutality. Danger, positive danger, to spirituality, if not also to morality, lay in physical force and exuberant vitality. The same notions perverted the ideals of womanly grace and beauty. Robust vigor, a hearty appetite, and a ruddy complexion would have been deemed incompatible with the function of the heroine of a popular novel or a sentimental poem, or even with the part of a belle in society. Languor and pallor were attractive. Delicacy of frame and limb was admired.

The notions referred to were doubtless closely connected with the political ideas of those days. It was an era of transcendentalism in politics. Political mechanism was disparaged. The philosophy of the age declared that a virtuous people would of themselves make a good government. On the other hand, it was impossible so to organize the public force as to give a people a government that should be better than themselves. The maxim, "A stream cannot rise higher than its source," was a conclusive answer to all

pleas for the scientific treatment of political problems. There was an affectation of indifference towards size and numbers in national life. Quality, not quantity, was in the eyes of the men of those days the sole test of the worthiness and the greatness of a people. Mass went for nothing. "Mere bigness" was here, as in the case of the individual, a term of infinite contempt. I never shall forget the rebuke, not unkindly meant or harshly spoken, which I received from a distinguished leader of public thought for boasting in a boyish vein about the extent of my country and the greatness of its resources.

The indifference towards or the dislike of athletics a generation or two ago was also largely due to the religious ideas and feelings of the time. The body was but a shell, a prison in which the soul was confined, and against whose bars its aspirations continually beat and bruised themselves. In another image, the body was a wayside barn in which the weary pilgrim laid himself down to rest till break of day. The flesh was an encumbrance to the spirit, a clog, a burden, a snare. Men had been told to "keep the body under"; and, perchance, this was thought to be an easier task if that body were small and weak.

I do not mean to be understood as asserting that in those days the *mens sana in corpore sano* was never spoken of, or that there was no formal teaching of the duty of preserving bodily health. Such precepts, however, could have little effect against general tendencies of thought and feeling; and even among the most intelligent teachers of those days there was manifest a strong dislike, a sharp shrinking from all dwelling upon the physical basis of life, as savoring of materialism. As to acknowledging the relationship of man to the other orders of animals, that would have filled the pious mind with horror. The philosophy of the time had, indeed, to admit that the soul was in a degree conditioned as to its manifestations, and especially as to its influence upon others, by purely physical causes. But the soul itself was a thing transcendent, supernal, and self-sufficing, which, when released from the clogs of flesh, became at once as perfect, pure, free, and strong as if its tenement, while in residence here, had been more worthy of it.

All the notions referred to, so prevalent and so potent in at least this section of the United States forty or seventy years ago, have gone, and gone together. Other ideas, better suited to inspire a progressive civilization, have taken their place. In part this has been due to the decay of superstitions derived from primitive savagery, in part to the effects of positive teaching, in greater part still

to further experience of life. Biology has done its share. Political education has done its share. The war of secession wrought its appointed work in the same direction. The men of to-day are generally agreed that they are likely to live long enough to make it wise to think a hundred times how they shall live to once thinking how they shall die. The caravansary idea of existence has been abandoned. Man is not a pilgrim, but a citizen. He is going to tarry nights enough to make it worth while to patch up the tenement and even to look into the drainage. This world is a place to work in, activity and development, not suffering or self-repression, its law.

The present generation has witnessed a wonderful diminution of spiritual self-consciousness. Better physiology, coinciding with some changes in popular ideals, has driven away the notions about the flesh as an encumbrance, a clog, a burden, a snare. It is seen that morbid or even merely feeble conditions of body tend to generate delusions, selfishness, and susceptibility to the worst impulses. This is seen to be the case not the less because of the saintliness and the heroic constancy of a million sufferers from pain and infirmity. Hearty physical force may, indeed, consist with vicious desires; but it does not favor them. On the contrary, it does in a way and in a degree tend to diminish and to uproot them. Vicious desires are at their worst in feebleness and in morbid conditions of body. The sounder a man is, the stronger he is, the less — other things equal — is he subject to what is bad and degrading, the more pleasure does he take in what is natural, healthful, and elevating. To a man perfectly sane physically, life itself becomes a joy. The relish for it does not need to be stimulated by the spices of vicious indulgence any more than a healthy appetite needs to be stimulated by the spices of the *cuisine*.

The sociological investigations into the causes and manifestations of crime, so actively in progress during the past few years, have added much to our knowledge of human nature in its self-respecting and law-abiding phases. The popular idea of the criminal once was that of a powerful brute, whose offences against society resulted from an excess of physical vigor not counterbalanced by moral and intellectual forces. It is now known that, as a matter of fact, the prisoners in our jails are, as a class, undersized and undervitalized creatures, often with a deficiency of co-ordination between their faculties, sometimes with a minimum of control over their own actions, and little adaptability to social and industrial functions. In the remarkable, the truly admirable reformatory enterprise of Super-

intendent Brockway at Elmira, gymnastics, regulated exercise, and manual training perform a most important part.

In the revolution of thought regarding bodily development and physical prowess Mr. Beecher exerted a great influence. He it was who led off in favor of Muscular Christianity. During the controversy on that subject which attracted so much attention just before the outbreak of our great war, there was, we must admit, not a little exaggeration on the part of the advocates of physical culture. Many wrote and spoke as if all evil were to be worked off in the gymnasium and on the race track; as if every vice of human nature would exude through the pores of the skin, were perspiration only sufficiently active and long enough maintained. But, in spite of much that was crude and foolish, these men had hold of a great truth; and they did not let go until they had drawn it out into the light. The war of secession, also, which has been adverted to, came in to produce a vast change in popular sentiments and ideas, as it showed how much nobler are strength of will, firmness of purpose, resolution to endure, and capacity for action than are the qualities of the speech-maker and the fine writer which the nation had once agreed chiefly to admire.

With this change of opinion regarding physical force and physical training in the individual has come a notable change in the political philosophy of the age. Larger experience of affairs has shown the folly of disregarding political mechanism. It is seen that it is hard enough to keep the balance of forces upon the right side, if every safeguard be adopted, every device used, and every means employed to give a preference to those who stand for order, decency, and honesty in the community. We are all now for making the devil fight with the sun in his eyes instead of at his back, and with the advantage of the ground against him instead of in his favor. We no longer with confidence hold that a virtuous people will necessarily have a good government. On the contrary, we recognize that a people virtuous above the average may be made, through a bad organization of the public forces, to act almost as if they were the most cowardly and dishonest of their kind, as did our forefathers under the confederation of 1781–87. It is true that the stream may not of itself rise higher than its source; but by machinery we can send a stream a good deal higher than its source, and can make it do there more of vitally essential work than could all the waters of old ocean lying at their level. Instead of discarding political mechanism, therefore, the men of to-day believe in political machinery like that of the Australian ballot system.

They have learned that by means of it they can help the cause of righteousness, and at times turn the scale against the forces of evil. They not only believe in political machinery, they even believe in political machines, actual structures of wood and glass like the patent ballot-box, as important agencies to defeat the baser elements of society.

Again, "mere bigness" has ceased to be a term of contempt as applied to nations. Power in a people has become a thing admired. It is felt that it is, indeed, a glorious thing to have a giant's strength; nor is it longer believed that the disposition to use strength tyrannously grows with the opportunity. The idea once prevalent that its possession leads to brutality and insolence has not been borne out by the history of our own people. As the United States have grown more powerful, they have grown more peaceful. In the early days of the republic our petulance, irritability, and pugnacity made us a nuisance and a pest among the nations. Swagger and unbounded brag characterized our earlier diplomatic history; while the war with Mexico, the cheap talk about "manifest destiny," and the filibustering excursions of the middle of the century seemed to point us out as a bad neighbor to the strong and a bully towards the weak.

Doubtless the slave power was in some degree accountable for this; but in greater measure it was due to lack of confidence in ourselves. We were always afraid that we were not going to be respected and treated with due consideration. We felt that we were looked down upon because we were young and small. No sooner was the mighty demonstration made of our courage and military strength in that great Civil War which will always remain one of the marvels of human history than all this fell away from the nation like some loathsome rheum of childhood. To-day Canada and Mexico repose under the shadow of our irresistible power without an apprehension of harm or wrong, and it is even difficult to secure from an over-lavish Congress appropriations sufficient to enable us to make a decent show of naval power in the great harbors of the world. It is true we have recently suffered an apparent brief access of jingoism, owing to certain unfortunate political complications; but the readiness with which the affair with Chili was adjusted, and the general applause with which our flag was hauled down from the government house at Hawaii, showed how superficial and how partial was the infection.

After this long and tedious statement of changes in the ideas and sentiments of our people in the several directions indicated, is it too

much to say that, as a community, we have got down upon a sound, practical, sensible, worldly basis of life, much more promising for morality, for steadily progressive civilization, for enduring enthusiasms,— ay, for worthy aspirations and a true spirituality,— than the unreal, morbid transcendentalism and sentimentalism of three, two, or even only one generation ago?

Among the many things, good or bad as people may esteem them, resulting from the changes in feelings, views, and ideals which have been indicated, are two which especially concern colleges and college men. The first is the general disappearance, most fortunate as I esteem it, of the literary societies formerly so flourishing, and the decay of oratory, declamation, and debate, which to many once made up the main interest of college life. The second is the rapid growth of athletics, in which immense honor is given the young men because they are strong, swift, enduring, and brave, in which the blood of the whole community is stirred by physical contests among the picked youth of the land as once it was stirred only by tales of battle. This last it is which has given me my subject to-day.

That the general introduction of gymnastics into colleges is desirable few will deny. Young men of the college age, whose occupations are largely sedentary, should be encouraged to undertake systematic and extended exercise, in order to correct the faults of the study and recitation-room, to expand their frames, and to promote an active circulation. Amherst is entitled to the high honor of being the first of the American colleges to make ample and suitable provision for students' needs in this respect. In 1861, under the presidency of Dr. Stearns, a gymnasium, large and well equipped according to the standard of those days, was placed upon the campus. Daily exercise was made compulsory upon students not excused for cause, and a certificated physician was made director of physical culture and lecturer on physiology and hygiene. Few colleges have followed Amherst in making exercise other than in the form of military drill compulsory;* but fewer still now fail to afford their pupils wide opportunity for voluntary gymnastics to the top of their bent. The improvement thus wrought in the physique of our

* There is no such source of *in*discipline as pretended military drill and training when the requirements are not promptly, severely, and unflinchingly enforced. There is no better training for mind and body than military drill well and intelligently carried on. All modern drill associates with itself "setting-up" exercises and regulated gymnastics. The modern soldier must be an athlete.

I think there is nothing which the young men of this country need more than to be taught to obey, to "mind," as the boys say, and to do it without any nonsense, or "back talk," or

college students does not need to be shown statistically. It is manifest to the eye of the most casual observer who remembers the former state of things. So far there is no ground of debate: difference of opinion exists only with respect to the competitive sports and games which have grown out of the newly awakened interest in physical prowess.

And here let me propose a distinction between gymnastics and athletics, which will be carried through the remainder of this discussion. That distinction is not one based upon etymology, but has reference to current usage.

Gymnastics are for individual training and development with health strongly in view. Athletics take the form of competition and contest: emulation is their moving spirit, glory their aim.

As thus distinguished in their primary objects, athletics differ from gymnastics in two respects: first, by specialization, as when a man chooses his line of work in athletics,— whether that be pole-vaulting or hurdle-racing or rowing or pitching in baseball or playing a certain position in football,— and thereafter devotes his energies to working himself up to the highest point of efficiency in that line; secondly, by excess in the amount of exercise over what would be required or would be performed without the introduction of the spirit of emulation. So great is this excess that it may not unfairly be said that athletics begin where gymnastics leave off.

The effects of specialization in athletics are too much a matter of detail to be entered upon here. Suffice it, in a word, to say that they are not unlike those of specialization in industry, good and evil being mingled, with, in general, the preponderance largely on the side of the good. Specialization affords to bodily exercise a more direct object, and creates a far more intense and sustained interest. Moreover, for the best specialized work it is well known that at least a fair all-around development is almost always a necessary condition.

The excess of exercise in athletics over gymnastics, as we have defined these terms, is it of good or of evil? Is it a gain or mere waste or a positive injury? Gymnastics are a means to the end of health and vigor. Athletics become an end in themselves. With

delay. For lack of this we are raising up a large class of boys who, in mind and character, are perfect "punk," without fibre and without grain.

I do not say that military training and drill in high schools, even under the best officers, would remedy all this,— in most cases the evil is done before the boy reaches that point; but I have no doubt that the effects would be beneficial. I am not in favor, however, of small or feeble boys carrying muskets.— *Answer to the question: "Do you believe that military drills are consistent with pedagogy?" asked in a circular letter from the editors of "Mind and Body,"* 1896.

exceptions too inconsiderable to be enumerated, the athlete competing for championship honors takes more exercise, often far more exercise, than is required for health and strength with a view to the peaceful and industrial pursuits of life. Vital force is consumed, not created, by the final contests in which he engages, and not infrequently by the training to which he subjects himself in preparation for them. The consumption of vital force in athletics, if we contemplate young men who are fully grown or nearly so, may be considered as of two degrees: first, where vital force is consumed in competitive sports and games as it might be consumed in study or in the production of wealth, without impairing the constitution or diminishing the physical endowment upon the strength of which the subsequent work of life is to be done; secondly, where exercise is carried so far and such violent exertions are made that not merely is the current supply of vigor used up in this way, but the constitution is undermined and injuries are sustained or exhaustion induced which result in leaving the man less healthy or less powerful through the remaining years of his life.

Of the severer forms of athletic competition and contest, which injuriously affect the constitution and permanently impair the vital force, but one thing can be said: they are evil and only evil. No earthly object, except the saving of others' lives or the defence of one's country, could justify such destructive exercises and exertions. I am disposed, however, to believe that there has been much exaggeration in the public mind regarding this matter, and that instances of permanent injury from athletics are fewer than popular rumor or maternal anxiety makes them to be. The life history of the leading football players of the past fifteen years, notwithstanding the frequency with which contusions, sprains, and even broken bones occur in the tremendous struggles of that mighty game, makes up a record of vitality and activity in the period succeeding graduation which proves that, despite the occasional outcries of the press, this form of athletic contest works little enduring injury among thoroughly trained competitors. The more serious accidents of football generally occur in the beginning of the season, and among players who have not passed carefully through the hardening stages of practice. Boat-racing is probably fraught with much more real peril to its participants; yet a distinguished English statistician, studying the life history of three hundred and twenty "Oxford oars," has reached the conclusion that, even after making due allowance for the fact that these were all at the start picked men, this great body of athletes showed a vitality distinctly above the

average. Yet, when all has been said, it is still beyond question true that in the present intense interest in physical contests there is a real danger to be guarded against, especially among the younger and less experienced competitors.

Of those physical contests which result merely in the consumption at the time of current physical force which would otherwise, or might otherwise, be devoted to study, we cannot dispose so confidently and summarily. To those who hold to the good old notion — the excellent, virtuous notion — that all young men go to college to make themselves scholars, it is, indeed, a great trial to have to contemplate a state of things in which no inconsiderable proportion of students treat scholarship as an object distinctly subordinate to gladiatorial prowess, and who are graduated really, if they are graduated at all, in athletics as a major, with classics, or mathematics, or philosophy, or something else as a minor,— or perhaps we should say a minimum. Certainly, this presents a view of college life which would have filled with horror the founders and early governors of our New England colleges. And it needs to be said at the outset, in dealing with this subject, that there are hosts of young men coming to college whose circumstances and means and views and plans of life are such that they cannot afford to treat their educational privileges in this way; who, if they "go into athletics," in the accepted sense of that phrase, will sacrifice the one opportunity offered them; whose presence with their classes means a degree of sacrifice and self-denial on the part of parents and friends which would make it little less than profanation to waste an hour of the time purchased at such a price. And yet, with due consideration for the rights and interests of students like these, college athletics, confessedly as an end in themselves, are not wholly evil. Several things have to be considered before we are fairly in a position to pass judgment upon them.

The least important thing that can be said in their favor is that they afford enjoyment to vast numbers throughout the land; yet, for one, I would not treat even this consideration as unworthy of respect. The college athletics of to-day do wonderfully light up the life of our people. The great recurring contests and the intermediate practice games and friendly competitions of the several teams give acute delight to a large and increasing constituency. This nation has long shown the painful need of more in the way of popular amusement, of more that shall call men in great throngs out into the open air, of more that shall arouse an interest in something besides money-getting or professional preferment. In these

respects college athletics have made an important contribution within the past few years. The marvellous rapidity with which football has spread, and is still spreading throughout the Western and Southern States, shows how eagerly it is welcomed as a relief to the monotony of life.

A stronger plea for college athletics is made when it is urged that they result in stimulating an interest in gymnastics not only among those students who do not engage in competitive contests, but also throughout the general community. The effect of this may easily be exaggerated. There is many a weak-kneed collegian who crawls out to witness the great baseball or football game of the year, looks on with intense delight, cheers the victors, if of his own side, as loudly as his limited lung capacity will permit, and then, when all is over, crawls back again to his room without so much as a conscious impulse to improve his own bodily condition. Yet it is certain that the cause indicated has an influence, and an influence not inconsiderable, for good. Admiration for manly prowess and the contemplation of fine physical development cannot fail to secure a much wider cultivation of gymnastics than would take place without it.

But, again, it must be said that the favorite athletics of to-day are, in great measure, such as call for more than mere strength and swiftness. They demand also steadiness of nerve, quickness of apprehension, coolness, resourcefulness, self-knowledge, self-reliance. Further still, they often demand of the contestants the ability to work with others, power of combination, readiness to subordinate individual impulses, selfish desires, and even personal credit to a common end. These are all qualities useful in any profession. In some professions they are of the highest value, and it cannot be gainsaid that it is the normal effect of certain kinds of athletic sports to develop these qualities among the contestants, as well as to afford impressive examples to the minds of the spectators. So genuine does this advantage appear to me that, were I superintendent of the academy at West Point, I would encourage the game of football among the cadets as a military exercise of no mean importance. It is the opinion of most educated Englishmen that the cultivation of this sport in the public schools of that country has had not a little to do with the courage, address, and energy with which the graduates of Rugby, Eton, and Harrow have made their way through dangers and over difficulties in all quarters of the globe.

The last consideration which I would adduce to show that what is sacrificed in athletics is not all lost is that in the competitive con-

tests of our colleges something akin to patriotism and public spirit is developed, with results, on the whole, of good. It is true that young men often carry their manifestations of zeal and devotion to their colleges too far. Yet, both as counteracting the selfish, individualistic tendencies of the age, and as an antidote to the *nil admirari* affectations of our older colleges, it is a good thing that the body of students should now and then be stirred to the very depths of their souls; that they should have something outside themselves to care for; that they should learn to love passionately, even if a little animosity towards rivals must mingle with their patriotic fervor; that they should at times palpitate with hope and fear and anxiety in the view of objects which can bring to them personally neither gain nor loss.

Of the special evils of college athletics as now cultivated I do not purpose to speak at length. Some of those at present most clearly perceived are chiefly due to newness and rawness, and will of themselves disappear, in whole or in part, with time and further experience. Faults of method have yet to be eliminated; the traditions of the several games have yet to be created. For example, that regard for fair play, that respect for the rights of an opponent, that deference to the decisions of the umpire,— so conspicuous in England,— have there been the work of generations. They cannot be built up in a day with us. Yet our people are wonderfully quick to learn, especially to learn everything that conduces to harmony and adjustment of claims. The American is eminently and pre-eminently a political animal; and nowhere in the world are great crowds so orderly, peaceable, and good-natured as here.

One of the first things which should receive the attention of all lovers of fair play is the complete abolition, once and for all, of the unsportsmanlike system of organized cheering by great bodies of collegians grouped together for the purpose, with chosen youths of peculiar gesticulatory graces and extraordinary lung power to start the movement and "deacon off" the shouting. Such a line of conduct, thoughtlessly resorted to in the heat of partisanship, is unworthy of educated men. It is unfair to the visiting team, who by all the laws of courtesy are entitled to special consideration. How much more pleasing to the spectator, how much more creditable to the home college, if the stranger for the while within its gates were to be treated with something like the grace of antique chivalry!

Again, we may confidently expect that the machinery for carrying on sports and contests will undergo a steady improvement. We see a remarkable instance of the virtue of this in the appoint-

ment of the second umpire at football, which at once did away with certain tendencies that had threatened to make the game impossible. Audiences, too, must be trained to appreciate the finer points, to applaud good work by whomsoever done, and to be as virtuous as a Greek chorus, to the end that the game may be played by the players and not by the spectators. The co-operation of alumni is also to be invoked to give wisdom, weight, and temper to the action of the undergraduate bodies. Not least — nay, perhaps hardest of all — Faculties are to be educated, to avoid intermeddling and petty dictation on the one hand, and to sustain the claims of scholarship and enforce the right discipline of college on the other.

The last clause suggests one of the most important considerations related to the subject. Granting that something, and not a little, of scholarship must be sacrificed if athletics are to be continued on anything approaching their present scale, may we yet believe that it is practicable to insist upon the requirement of at least respectable standing in the case of all who participate in intercollegiate contests? I believe that this can be done without interfering with the general movement, provided college Faculties are true to themselves, fair, frank, and firm in dealing with the student bodies, and thoroughly honest in their treatment of the subject. I would not be understood to intimate that a certain amount of good sense would be out of place.

Perhaps it will not be taken amiss if I allude here to the results of my own observation in a sister university regarding which it has been my lot to know more than I do concerning Harvard. At Yale, and especially in the scientific department, the Faculty appear to me to have been highly successful in preventing a total sacrifice of scholarly standing to intercollegiate sports. But a small proportion of the champion athletes in that university, a smaller proportion still in the Scientific School, have been men at or near the foot of their classes,— the sort of men who have to be hounded, threatened, and repeatedly conditioned in order to keep them up to the mark. Not a few of them, from Kennedy to Hartwell, have been high up on the roll of academic honor. I attribute this excellent result to the thoroughly good understanding between students and the Faculty, to the absence of petty prescriptions and of all intermeddling as to details, and to the frankness with which the few positive requirements relating to the subject are stated and enforced.

I fear there is little in what has been here said to give comfort

to those who distrust and dislike college athletics,— little which intimates the opinion that the athleticism of to-day is only a reaction after the former total neglect of gymnastics or a mere passing passion among our youth. But, if we concede that these exercises and contests are to hold their place in American life, is there no stopping-place, no point at which college authorities or the young men themselves, on their own motion, in their own discretion, for their own good, can say, "Thus far and no farther"?

I answer yes. There is such a natural stopping-place. It is at the doors of the professional school. Among young men in the course of education, athletics should belong to the college stage; gymnastics, to all stages. Whether this shall be done by regulation, or be left to the operation of forces working upon the minds of the individuals concerned, I believe the result indicated will, in either case, be reached. Already the undergraduate principle is widely though irregularly recognized; and the movement of opinion is still clearly in progress in this direction. Here at Harvard you have seen many a renowned champion put off athletics as he entered the Law School or the Medical School. The rule should be made of universal application; and it will require but a little more discussion, a little higher education of student-opinion, to bring this about. In and after the professional school, whether that be a school of law, of medicine, of divinity, or of technology, there should be no representative teams. The principle of competition and championship should be dropped. Individuals should continue, at their pleasure, to play tennis or cricket or football with their classes, with private clubs, or in town and county matches; or, if teams be formed in such schools, they should not be regarded as carrying the honor of their institutions around with them. Such teams should not expect victory. They should play for exercise and for the fun of the thing, and should accept their inevitable beating with serenity and good nature, recognizing the fact that, since they have taken up the serious work of professional preparation for life, they no longer have the time or the strength at command to make and to keep them champions.

There is one remaining question regarding the athleticism of to-day, which I feel myself so little qualified to discuss that I did not even allude to it while enumerating the things that might be said in favor of competitive sports, or at least in deprecation of the hostile criticisms directed upon them, but which, in closing, I would propose to your sounder judgment and keener thought.

It is whether the college athletics, which so many approve and

so many condemn, have not, after all, a deeper significance,— whether this remarkable outburst of enthusiasm for physical development and for the perfecting of the human body is not related, perhaps vitally and intimately, to the growth of a feeling for art in this new land of ours. No classical scholar will for a moment admit it to have been an accidental coincidence that the nation of the Old World which pursued athletics with the most passionate eagerness, which showered honors upon the victor in running or in wrestling not inferior to those which it gave to the author of an accepted tragedy,— that nation whose tribes came by long and perilous journeys over stormy seas to witness the great athletic competitions by the banks of the Alpheus or on the Crissæan plain was the same nation which carried the arts, and especially the plastic arts, to the highest point of perfection ever attained.

If, indeed, there is believed to have been a vital connection between these seemingly diverse manifestations of Grecian life, who shall say that the remarkable enthusiasm for physical training and the intense interest in athletic contests which have been so suddenly developed in our country may not be clearly seen a generation hence to have accompanied, and that through no accidental association, the elevation of art to a far higher and nobler place than it had before occupied in the thoughts and affections of our people? The life-class is the true school of the artist. The greatest of all who bear that name have been men who revered the human form, made it their chief study, and found in it their highest delight. If, in truth, this sublime passion is taking possession of the nation, who shall estimate at a price the worth of that inspiration? The vision of the Apollo may yet rise to the view of thousands out and up from the arena at Springfield, as erst it rose before the thronging multitudes of Olympia.

FRANCIS A. WALKER.

EXAMPLES OF NOTABLE WORKS BY INSTITUTE MEN

GEORGE ELLERY HALE, '90, IN ASTROPHYSICS

At a recent meeting of the Society of Arts a large and appreciative audience had the pleasure of listening to a beautifully illustrated lecture by Professor George E. Hale, director of the Yerkes Observatory, on the recent discoveries and advances made with the great 40-inch telescope. Those of the audience who were unfamiliar with Professor Hale's numerous publications, and with his characteristic modesty, would never have realized from his lecture the importance of his own discoveries, or the extent of his co-operation and suggestion in the work of others. The following sketch of Professor Hale's work since his graduation from the Institute, less than eleven years ago, cannot fail to be of interest, not only to members of his own class, but to all Institute men as well; for he is recognized in the scientific world to-day as one of our most illustrious alumni,— one whose splendid achievements are an honor to his class, to his course, and to the Institute. Few of our men have made for themselves in the first few years after graduation not only a national, but international reputation; but that is Hale's record. He is to-day not only director of the finest observatory in the world, but also one of the recognized leaders in modern astronomy, or astrophysics.

Hale was born in Chicago, June 29, 1868. His love for investigation manifested itself while he was still at school, his workshop and "lab" being always his favorite recreation grounds. Fortunately, he was encouraged in following his natural bent by a very wise father, who, recognizing his son's unusual aptitude for research, did everything in his power to further his progress in his chosen line of work. Hale prepared for Tech at the Chicago Manual Training School, and entered with the class of 1890 in 1886. His love for science at that time was so developed that it left no ques-

tion as to choice of course. Course VIII was a foregone conclusion. He had from the first the definite idea of becoming an astronomer,— not of the old mathematical school, but of the modern school of astrophysicists, and his Institute course was, so far as was practicable, shaped to that end. This was made the more possible through the courtesy of Professor E. C. Pickering, director of the Harvard College Observatory, and previously the first director

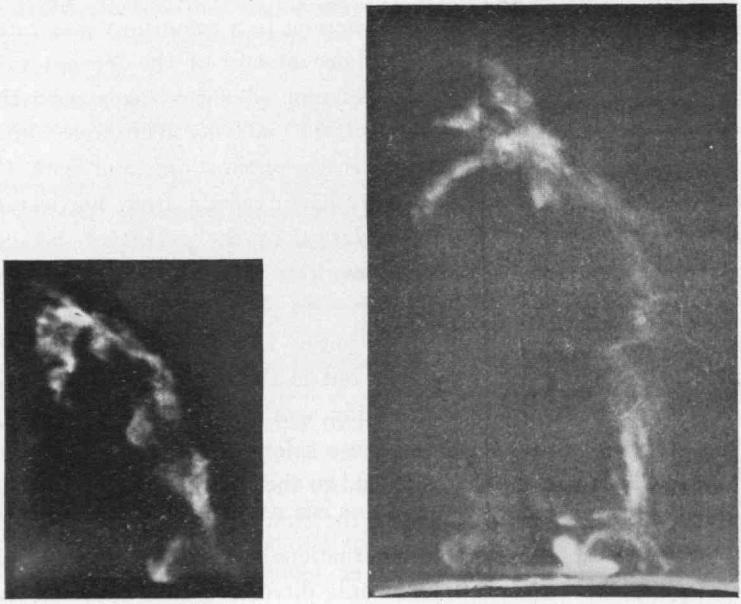

Figure 1.

of our physical laboratory, who has always maintained the kindest interest in our work. It is gratifying to know that now, as then, Hale regards our course in physics as the best undergraduate course for students desiring a scientific training to be had anywhere in the country.

In the summer of his Sophomore year, Hale's father built and equipped for him a private spectroscopic laboratory at his home in Chicago. This laboratory was the beginning of the Kenwood Observatory, which was equipped in 1891 with a fine 12-inch tele-

scope. It was here that Hale took up his researches on the sun, immediately after his graduation from the Institute in 1890. Before his graduation he had devised a new instrument, the spectroheliograph, which was used in his thesis carried on at the Harvard Observatory. With this instrument he succeeded, in 1891, in photographing for the first time without a total eclipse, the solar

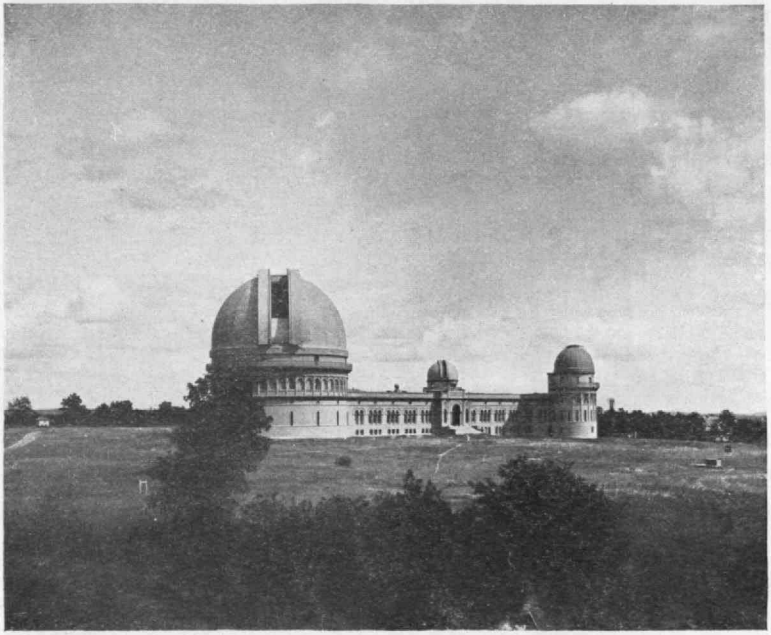

Figure 2.

prominences, and also the faculæ and fine structure of the solar disk never before obtained. This was done by a most ingenious device, consisting of two simultaneously moving slits, by which the object was photographed with monochromatic light emitted by some line in its own spectrum. Figure 1 is a photograph of an enormous eruptive prominence obtained with this instrument. The two views are of the same prominence taken eighteen minutes apart, and indicate the velocity with which this mass of incandescent vapor was projected from the sun. The solution of this difficult prob-

lem in solar photography, which had long been the goal sought for by eminent astronomers, established for Hale at once ar international reputation as an astrophysicist.

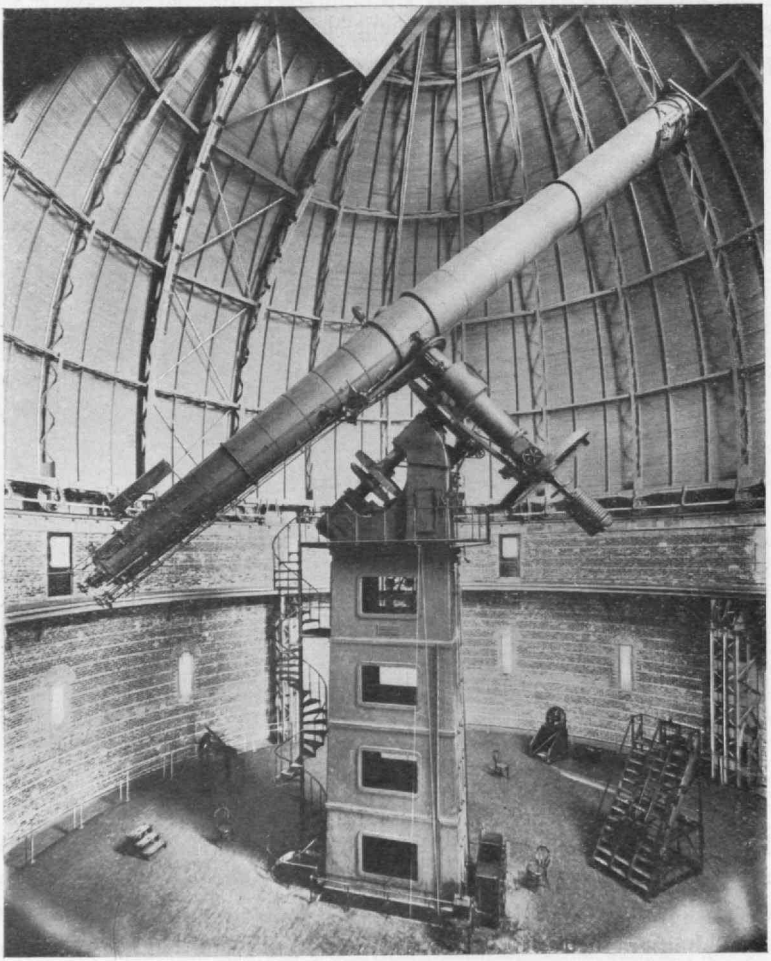

Figure 3.

Soon after the establishment of Chicago University, Hale was appointed to the Faculty and put in charge of the research department of astronomy. The wisdom of putting so young a man in so

responsible a position, the sequel has proved. When, in the summer of 1891, it became known that the two 40-inch disks made for an observatory in Southern California were for sale, Hale made up his mind that the university must have them; and through his energy a gentleman was soon found who was willing, not only to pay for the disks and to have them ground and mounted, but also to build what is acknowledged to be the finest observatory in the world. This gentleman was Mr. Charles T. Yerkes, of Chicago, for whom the observatory is named. The site chosen was at Williams Bay on Lake Geneva, Wisconsin,—a beautiful lake about seventy-five miles from Chicago. The winter of 1894 was spent by Professor Hale and his wife in Berlin, where the plans of the new observatory were perfected with the greatest care.

The observatory was completed in the summer of 1897, and dedicated in the following October. Its imposing exterior is shown in Figure 2, and the interior of the great dome containing the 40-inch telescope in Figure 3. The telescope itself is 62 feet in length, and the dome 90 feet in diameter. The floor, 75 feet in diameter, can be raised or lowered through a distance of 23 feet, the dome revolved, the shutter opened or closed, and the telescope pointed in any direction by the operator standing on the floor and manipulating the various rheostats seen on the floor at the right of the telescope mounting. As director of this large institution, Hale has shown no less executive ability combined with infinite tact than he had already shown ability as an investigator.

A unique feature of the Yerkes Observatory is its splendidly equipped optical and machine shop for the construction of the elaborate instruments which it is necessary to use either as accessories to the large telescope or for new work in hand. Practically, all of the superb spectrographs, spectroheliographs, cœlostats, and mirrors now in use at the observatory have been made in the observatory shops from original designs worked out by Professor Hale and his associates. Figure 4 is a view of his new spectroheliograph just completed, attached to the end of the 40-inch refractor, by means of which photographs similar to that shown in Figure 1 are taken, only on a very much larger scale, the image of the sun being seven

inches in diameter. The photographs of the prominences which this instrument will furnish during the next period of solar activity, about four years hence, will be on a scale of magnificence unprecedented. Figure 5 is a photograph (not enlarged) of a small sun spot and surrounding faculæ recently taken with this new instrument.

Another important research to which Hale has given much atten-

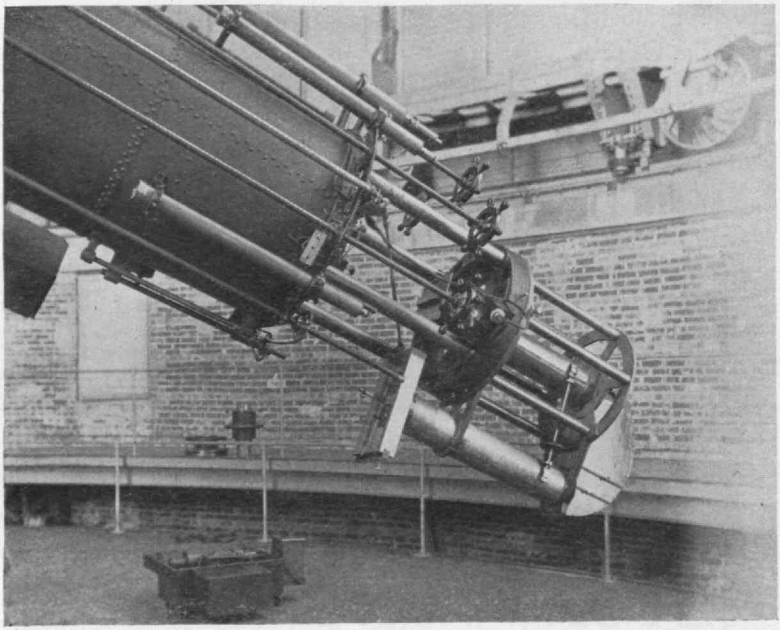

Figure 4.

tion is the photography of the corona without a total eclipse. This problem, as is well known, has long baffled the skill of astronomers; and, indeed, it remains unsolved at the present time. He first attacked this problem with Professor Keeler on Pike's Peak in 1893. During the spring of 1894 he and Mrs. Hale, together with Professor Ricco, ascended Mount Ætna, where they lived for a number of days while, with a new method and apparatus, he again tried to photograph the corona. Failure, however, seemed only to serve to

increase his ingenuity; for he soon after proposed an entirely novel method, which is being worked upon now with every indication of ultimate success. This method consists in mapping the corona not by its light rays, but by the heat which it radiates to a bolometer or radiometer.

Hale's researches have not, however, been confined to solar investigations alone. Many other important spectroscopic investi-

Figure 5.

gations have also been worked out in the laboratory. With the great light-collecting power of the 40-inch telescope at his disposal, he has recently been working on the spectra of certain peculiar red stars, and has been able to draw some important conclusions relative to their classification in the system of stellar evolution. It is known that the spectra of all stars can be arranged in one of four groups, or "types," each type being characteristic of one stage in the evolution of the star. The spectra of certain stars, however,

seemed to offer exceptions; but Hale has shown from their spectra that they can be so arranged as to show a gradual transition from the accepted III type to the IV type, corresponding to their respective ages, or stages of evolution. Figure 6 is an enlarged photograph of the spectra of four of these stars of the IV type, showing

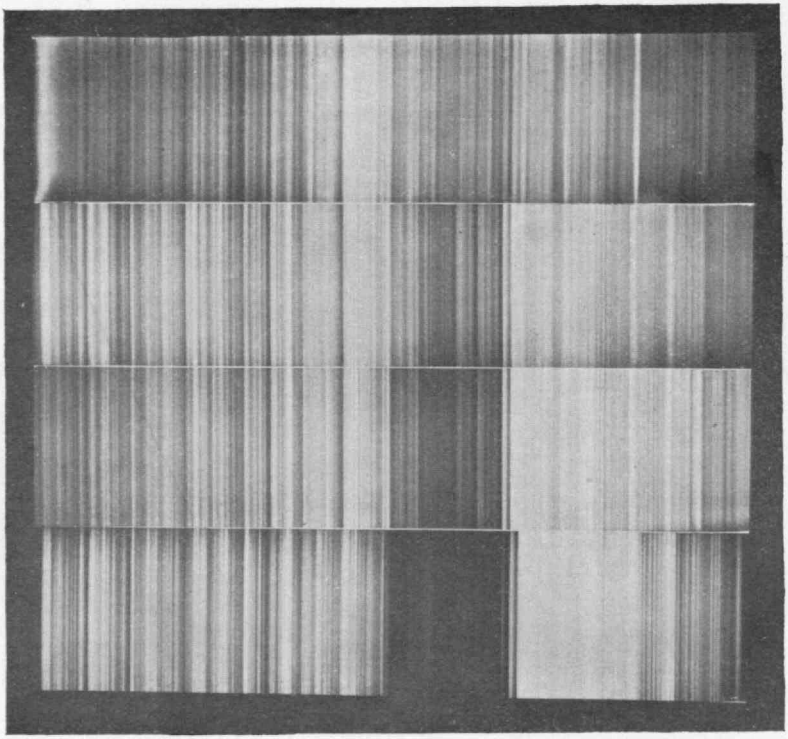

Figure 6.

the gradual change in spectrum from one to the next, from which these far-reaching conclusions may be drawn.

The most recent contribution from the Yerkes Observatory is the demonstration that visual telescopes, like the Lick and Yerkes instruments, may be used with great success for photographic work. In visual instruments the objectives are corrected for achromatism so as to bring to a sharp focus those rays most affecting the eye,—

i.e., the yellow rays,— while the blue and violet photographic rays are allowed to come to a focus where they will, usually spreading over a distance of several inches. By inserting a yellow color screen at the eye end of such a telescope, the blue and violet rays may be absorbed, and only yellow rays allowed to pass through. These will form a sharp image of the object on a photographic plate placed at the visual focus of the telescope; and, if the plate is sensitive to yellow light, which it can be made to be, a sharply defined photograph will be obtained. The apparatus for accomplishing this result has been perfected and used by Mr. Ritchey, the able optician of the observatory, who has unquestionably taken the finest photographs of star clusters and of the moon ever obtained. Professor Barnard has also employed this method to obtain photographs of faint nebulæ which exhibit structure invisible to the eye, even with the highest magnifying power. The field thus opened for visual telescopes, hitherto supposed worthless for photographic work, is enormous.

One of the wonderful lunar photographs taken with the 40-inch is reproduced in the frontispiece. This is a photograph of the lunar crater Theophilus and surrounding region, enlarged about five times. The detail here shown has never been equalled, even with the photographic correcting lens of the Lick telescope. Professor Hale expects that photographs of the planets will be obtained in the same manner in the near future.

The above brief sketch of Hale's work would be incomplete without mention of his editorial work; for, the value of his contribution to astrophysics, in establishing and editing a journal especially devoted to this branch of science, cannot be overestimated. Recognizing the need of a medium for the publication of the rapidly increasing number of researches in astrophysics and radiation, he established in 1892 the *Astrophysical Journal*, which from 1892–95 appeared in conjunction with what was previously known as the *Sidereal Messenger*, but which since 1895 has been published as an independent journal. Assisted by the late Professor Keeler and an able board of associate editors, and receiving the hearty support of the leading astrophysicists abroad, Hale has made the *Astrophysical*

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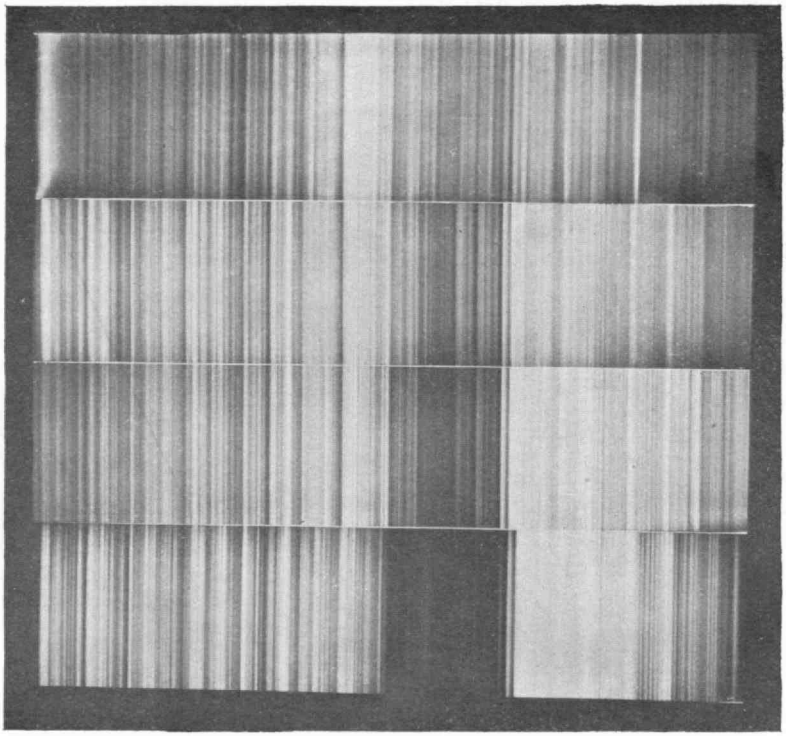

Figure 6.

the gradual change in spectrum from one to the next, from which these far-reaching conclusions may be drawn.

The most recent contribution from the Yerkes Observatory is the demonstration that visual telescopes, like the Lick and Yerkes instruments, may be used with great success for photographic work. In visual instruments the objectives are corrected for achromatism so as to bring to a sharp focus those rays most affecting the eye,—

i.e., the yellow rays,— while the blue and violet photographic rays are allowed to come to a focus where they will, usually spreading over a distance of several inches. By inserting a yellow color screen at the eye end of such a telescope, the blue and violet rays may be absorbed, and only yellow rays allowed to pass through. These will form a sharp image of the object on a photographic plate placed at the visual focus of the telescope; and, if the plate is sensitive to yellow light, which it can be made to be, a sharply defined photograph will be obtained. The apparatus for accomplishing this result has been perfected and used by Mr. Ritchey, the able optician of the observatory, who has unquestionably taken the finest photographs of star clusters and of the moon ever obtained. Professor Barnard has also employed this method to obtain photographs of faint nebulæ which exhibit structure invisible to the eye, even with the highest magnifying power. The field thus opened for visual telescopes, hitherto supposed worthless for photographic work, is enormous.

One of the wonderful lunar photographs taken with the 40-inch is reproduced in the frontispiece. This is a photograph of the lunar crater Theophilus and surrounding region, enlarged about five times. The detail here shown has never been equalled, even with the photographic correcting lens of the Lick telescope. Professor Hale expects that photographs of the planets will be obtained in the same manner in the near future.

The above brief sketch of Hale's work would be incomplete without mention of his editorial work; for, the value of his contribution to astrophysics, in establishing and editing a journal especially devoted to this branch of science, cannot be overestimated. Recognizing the need of a medium for the publication of the rapidly increasing number of researches in astrophysics and radiation, he established in 1892 the *Astrophysical Journal*, which from 1892–95 appeared in conjunction with what was previously known as the *Sidereal Messenger*, but which since 1895 has been published as an independent journal. Assisted by the late Professor Keeler and an able board of associate editors, and receiving the hearty support of the leading astrophysicists abroad, Hale has made the *Astrophysical*

Journal an unqualified success, and the accepted organ of publication for the astrophysical research of the world.

He was also active in establishing the annual Conference of Astronomers and Astrophysicists in 1897, which at its third meeting, held at the Yerkes Observatory in 1899, was organized into the Society of Astronomers and Astrophysicists of America, of which he is vice-president. He was chosen at the Cambridge Conference in 1898 as one of a committee of three to report on the condition of the work at the Naval Observatory. His authority on spectroscopic matters has been recently strikingly recognized by his being chosen to prepare the article on Spectroscopy for the new supplement to the *Encyclopædia Britannica.*

H. M. Goodwin, '90.

GENERAL INSTITUTE NEWS

CORPORATION NOTES

The President's Report, after a brief introduction, discusses at some length the question of the Walker Memorial, emphasizing especially the importance of a physical examination of all first-year students, prescribed systematic exercises, and the encouragement of such competitive athletic sports as secure out-of-door exercise and afford opportunity to the individual student. The report continues with the usual list of appointments and resignations and with other matters of the work of the preceding year, most of which have already been referred to in the Review. The departmental reports are somewhat briefer than usual, the whole report occupying, indeed, but fifty-five pages. An interesting innovation is the collection, toward the end of the report, of a list of publications of members of the Faculty and Instructing Staff, arranged by departments. The report closes with the usual statistics and a statement of the work of the Society of Arts, and is followed by the Report of the Treasurer. Acknowledgment is here made of the receipt of nearly $100,000 from the estate of Robert C. Billings and of $50,-

000 added to the Teachers' Fund from the executors of the estate of Mr. Augustus Lowell, who made the original gift of $50,000 a year earlier; also, of further receipts from the estates of Henry L. Pierce, Mrs. Julia B. H. James, Miss Susan E. Dorr, and from the trustees of the J. W. and Belinda Randall Charities Corporation. The total property of the Institute has been increased during the year by more than $200,000; but the income-bearing portion is, nevertheless, smaller, in consequence of the purchase of land.

The March meeting of the Corporation, at which reports are presented on the various departments, has been postponed in consequence of the President's absence in the West.

APPOINTMENTS

At the January meeting of the Executive Committee, ten instructors were promoted to the rank of Assistant Professor.

In the Chemical Department, Dr. Henry Fay becomes Assistant Professor of Analytical Chemistry and Metallography, Dr. James F. Norris Assistant Professor of Organic Chemistry, Dr. F. H. Thorp Assistant Professor of Industrial Chemistry, and Dr. W. R. Whitney Assistant Professor of Theoretical Chemistry and Proximate Analysis.

Dr. Fay graduated at Lafayette College in 1889, then pursued graduate studies at Johns Hopkins University, taking his degree of Ph.D. in 1895. He became connected with the laboratory of the Pennsylvania Railroad at Altoona, where he has since conducted occasional work of value. He was appointed Instructor in Analytical Chemistry at the Institute in 1895, having charge of the laboratory work of the more advanced students, and, at first, of that in molecular weight determinations. He has had charge of the instruction in chemical French and German, and has found time for researches of value, particularly in the field of metallography.

Dr. Norris is also a graduate of Johns Hopkins University, where he received his Ph.D. in 1895. From that time he has been successively Assistant and Instructor in Organic Chemistry at the Institute, having charge of laboratory and class-room instruction in that subject. He has had an important share in the supervision of

chemical thesis work, and has been specially interested in research work and in the literature and history of the science.

Dr. Thorp graduated at the Institute in 1889, and has been Assistant and Instructor in Industrial Chemistry continuously from that time, except for an interval of three years, during which he continued his studies at different points in England and on the Continent, receiving his doctor's degree at Heidelberg. He has had independent charge of the class-room instruction in industrial chemistry, and has prepared an important text-book on that subject.

Dr. Whitney graduated at the Institute in 1890, and has also been connected with the department continuously, except for two years of advanced study in Germany and France. He received the degree of Ph.D. at Leipzig. He has had charge of a portion of the instruction in theoretical chemistry, of the laboratory instruction in molecular weight determinations, and has recently taken an important share in the supervision of Thesis work along physico-chemical lines. He has laid out and put in operation a successful course of laboratory instruction in proximate technical analysis, including the examination of paper, rubber, asphalt, and soap, which is unique in its character and of marked efficiency.

In the Department of Mechanical Engineering the list of promotions includes three Institute graduates of the class of '92,— Messrs. Charles E. Fuller, William A. Johnston, and Charles F. Park. All three have been connected with the Institute continuously since their graduation, in work of increasing responsibility. Each of them has given instruction in mechanical engineering, laboratory work and drawing, while Messrs. Johnston and Park have also conducted classes in Mechanism. Mr. Fuller and Mr. Johnston are now conducting classes in Applied Mechanics in addition to aiding Professor Miller in the conduct of the laboratory; and Mr. Park has charge of the mechanical engineering drawing-room, and is also conducting a class in mechanism.

In the Department of Physics, Messrs. L. Derr, C. L. Norton, and Dr. G. V. Wendell have been appointed Assistant Professors.

Mr. Derr graduated from Course VI. in the Institute in 1892,

having graduated from Amherst College, of which he is also an M.A. He was appointed Assistant in 1892 and Instructor in 1893. His duties have been somewhat diversified, his most important professional work being, perhaps, the instruction in dynamo design, of which he is in charge. He has also developed an extended course of lectures upon photography, and, more recently, one upon calculating and computing machines. He has published a number of papers upon professional subjects, embodying the results of original research, in addition to valuable notes, for the use of the students, upon telegraphy and dynamo design.

Dr. Wendell graduated from Course VIII. in the Institute in 1892, and was thereupon appointed Assistant in Physics. At the end of a year of service in this capacity he was made an Instructor, and placed in charge of the newly instituted recitations in general physics, which he conducted successfully for three years, at the end of which he went to Leipzig to continue his studies. He devoted himself especially to the study of light, and took for his thesis an investigation of certain phenomena of rotary polarization. He received the degree of Ph.D. *summa cum laude* in 1898, remaining in Germany a third year for further study in Berlin, and then returned to the Institute to resume his former work. In addition to his regular work he has, during the past year, delivered a course of advanced lectures upon the Principles and Applications of Polarized Light. Since his return from Europe he has served the Institute in the capacity of secretary of the Society of Arts.

Mr. Norton graduated from Course VI. in the Institute in 1893, at which time he was appointed Assistant. In 1895 he was made Instructor in Heat Measurement, to which subject he has especially devoted his attention, and the course in which he has developed to a high degree of efficiency. He has made an extended series of tests of materials used for steam-pipe covering, and has also investigated very fully the diffusive effect upon light of ribbed and striated window glass of different kinds, these investigations having been made at the instance of the Factory Mutual Insurance Companies of New England. He has also published several scientific papers relating to heat measurement.

Mr. C. W. Hodsdon, of the class of 1900, has been appointed Assistant in Mechanical Drawing from February 9, in place of Mr. G. H. Riker, resigned. Mr. C. E. Littlefield has been appointed Assistant in Metal Work.

FACULTY NOTES

Professor Burton and Instructors Hosmer and Smith were granted leave of absence for the remainder of the present year as members of the Institute Eclipse Expedition to Sumatra, with a grant of $2,000 from the Austin Fund toward the expense of the expedition. Professor Ripley was granted leave of absence until October on his own application, in consequence of his appointment as special expert of the United States Industrial Commission. Professor Ripley is essentially the executive secretary of this important commission for its work in connection with the transportation interests. This brings him into relations with the men and forces controlling these great interests, and is not only a public service of value, but an important step in increasing the future resources of the economic work at the Institute.

A new course entitled "Municipal Sanitation," given by Professor Sedgwick, began this term. It is intended for fourth-year Course VII. and Course XI. members, and is an expansion of what has been taught on the subject under another head.

Professor Frank Vogel was elected, in December, a member of the Boston School Committee. While in college, he spent a summer at the German universities, and later spent a year and a half at Heidelberg, studying pedagogics. He has gone to Europe four times to study the English and Continental schools. Last summer he was abroad again, and made a special study of the London schools.

Professor Alfred E. Burton was elected president of the Bowdoin Alumni Association February 6.

Professor C. F. A. Currier has been elected a member of the Winchester School Committee.

ENTRANCE REQUIREMENTS

For more than a year past an interesting plan has been under way for co-operative entrance examinations, to be conducted by a College Entrance Examination Board. The plan first took definite shape at the meeting of the Association of Colleges and Preparatory Schools of the Middle States and Maryland. Arrangements have since been made for the organization of a board, representing both colleges and schools, which will prepare examination papers in a considerable number of subjects, and conduct the examinations at numerous cities in the United States and elsewhere about the middle of June. The board will issue certificates of the results of all examinations taken; and it is expected that these certificates will be accepted by colleges generally, so far as their own entrance requirements are covered. Each college is, therefore, wholly independent in its entrance requirements, as heretofore; but the problem of the preparatory school which has to send applicants to a number of different colleges is expected to be materially simplified.

The Faculty of the Institute has voted to accept certificates of the College Entrance Examination Board, provided they cover not fewer than three of our entrance subjects. This plan may in time render it unnecessary for the Institute to hold examinations at so many different points as heretofore. For the present, however, most of our outlying examinations will be continued.

Correspondence during the winter has led to arrangements for holding entrance examinations at the State capital, Austin, Tex., with a view to developing interest in a comparatively new region. Of still more importance is the plan for holding June entrance examinations at one or more points in England. It is the belief of the Faculty that such examinations will not only serve the convenience of American students who happen to be abroad, but that, by making the Institute better known in England, these examinations will attract a larger number of foreign students. In this connection, it may be added that inquiry has been made by correspondence as to the practicability of arranging for entrance examinations in Manila and in Bombay.

PUBLICATIONS

Besides the annual catalogue and Treasurer's Report, the recent publications of the Institute include a special pamphlet, reprinted from the last number of the REVIEW, on the Inauguration Exercises of October, 1900, and a special circular on the Department of Architecture. The catalogue contains this year not less than three hundred and ninety-two pages, of which the register of graduates occupies one hundred and seventeen. New features are a map showing the location of the Institute buildings and an alphabetical list of officers and students.

The new circular of the Department of Architecture is the most elaborate publication the Institute has made to represent the work in all its departments. Opening with a list of officers of administration and instruction, the text proceeds with an account of the history and present aims of the course, and with a systematic description of the work in the various professional lines,— history of art and architecture, drawing, water color and pen and ink, architectural design, construction and office practice, and general studies. This is followed by an account of the options in architectural engineering and landscape architecture, the graduate and summer work, scholarships and prizes, also of the buildings of the department. The circular is very fully illustrated, with not fewer than thirty-two full-page plates, including three in colors.

CALENDAR

Some years since the Institute calendar, after careful consideration by the Faculty, was modified by the introduction of a three days' recess in December and another in April. This year the experiment has been tried of prolonging the Christmas vacation to one week, the end of the term and the beginning of the second term being postponed in consequence. A committee of the Faculty has been appointed to consider again the general subject of the calendar, with particular reference, also, to the schedules of final examinations, which are at present a source of considerable inequality among the professional departments.

WALKER MEMORIAL

At the alumni dinner the Walker Memorial Committee reported subscriptions amounting to a little over $40,000. Numerous additions reported at the meeting increased the amount to nearly $50,000. During the month of January a new appeal was sent out to all who had not before contributed, and the total at this time is $58,966 from 778 subscribers. Early in the year a special committee appointed by the Faculty, consisting of the President, Professors Chandler, Swain, Dewey, and Hough, with the President as chairman, undertook the important and difficult task of preparing a report as to the character and organization of the Walker Memorial. It is expected that a provisional account of the work of this committee will be transmitted to all Institute men at an early date as a part of an appeal for subscriptions to complete the necessary total within the time limit, July 1, determined by the Corporation.

THE PRESIDENT

Readers of the REVIEW will be glad to learn that President Pritchett has fully recovered from the illness which kept him away from the Institute for the first six weeks of the year. Unfortunately, his plans for visiting alumni associations in other parts of the country during the month of February were necessarily given up; but he has since been able to carry out a part of the programme, visiting Cleveland, Chicago, and Kansas City.

On February 22 the University of Pennsylvania conferred a degree of LL.D. on President Henry Smith Pritchett. It has been the custom of the university each year, on Washington's birthday anniversary, to confer the degree of LL.D. on some person prominent in educational matters; and this year the honor has fallen to President Pritchett.

President McKinley has appointed President Pritchett one of the commissioners to test and examine the weight and fineness of the coins reserved at the several mints during the calendar year 1900.

SOCIETY OF ARTS

Since October the following lectures have been held by the Society of Arts: "Color Photography," by Professor L. Derr; "Some Experiments on Architectural Acoustics," by Professor Wallace C. Sabine, of Harvard University; "America's Contribution to our Knowledge of the Size and Figure of the Earth," by Dr. Pritchett, President of the Institute; "Applied Science in the Textile World," by W. W. Crosby, '93, Principal of the Lowell Textile School; "Landscape Architecture in this Country," by Mr. Guy Lowell, '94; "Shipment of Freights to Europe," by Mr. William H. Lincoln, president Boston Chamber of Commerce; "Astronomical Photography with the Great Visual Telescope of the Yerkes Observatory," by Professor George E. Hale, '90; "Designing of the Buffalo Exposition," by Mr. Robert S. Peabody.

GENERAL NOTES

The invitation that a delegation of students participate in the inaugural parade at Washington was not accepted by the Faculty.

An appropriation has been made to meet the expense of the exhibit at the Pan-American Exhibition at Buffalo; and a committee, of which Professor Homer is chairman, is actively engaged in organizing the exhibit.

GIFTS AND BEQUESTS

Early in the year the Institute was presented with a painting representing "The Discovery of Color from Coal (Aniline Dyes)." It was painted by Miss Anna Lea, a daughter of Mr. Joseph Lea, of Philadelphia, for the late Mr. John Fallon, of Lawrence, Mass., by whose estate the painting is presented to the Institute. Mr. Fallon was for years superintendent and agent of the Pacific Mills and a chemist of renown. He was also chairman of the State Board of Health, Lunacy, and Charity.

In reference to the retirement of Mr. Fallon from the Pacific Mills in 1880 the Boston *Advertiser* said, "There are probably few men living who have a better practical knowledge of chemistry

than he has, and in this his special line of business he has long been looked up to as high authority." Mrs. Anna Lea Merritt has been for years a resident of London, and has painted many portraits of celebrities, including those of Gladstone and Lord Salisbury. She has painted portraits of many notable people during her visits to this country, among others Earl Dufferin (while governor-general of Canada), Countess Dufferin, and the late James Russell Lowell. The chemists in the picture, which was painted in Paris in 1868, are Baron Hoffman of Berlin in the centre, Professor Louth of Paris on the left, and Mr. Lightfoot of England on the right. Each portrait was painted from life. The table depicted was in the laboratory of M. Chevreul, the great French chemist, who personally arranged it for Miss Lea to copy for this painting.

By the will of the late Moses W. Oliver, of Lawrence, probated in Salem, the residue of the estate after certain private bequests is left in trust for the benefit of Abbie A. Willars during her life; and at her death it goes to the Massachusetts Institute of Technology.

Mr. John J. May has given the Library twenty volumes on Chemistry and four on Geology and Surveying, from the library of W. C. May, V, '73.

The Library has received for the Department of Military Science a gift of one hundred and twenty-four volumes of the Records of the War of the Rebellion from Mr. S. N. D. North, secretary of the National Association of Wool Manufacturers.

The death of the widow of the late Henry Saltonstall has led to the payment to the Institute of his conditional bequest of $50,000.

A BIOLOGIST'S VACATION

The following is an extract from a letter written to one of the members of the Publication Committee; and, as it shows the type of work done by a member of the instructing staff while abroad, it is published in these columns.

After a brief tour in Belgium and Holland, I reached Berlin early in May, and immediately began my work. While in Belgium, I visited the new university at Brussels, and had a very pleasant conversation with Professor Effront, one of the best of the fermentation experts of Europe.

I decided that the best way to compare the European methods of instruction in Industrial Biology with those we employ at the Institute would be to spend most of my time in actual work in some of the best known laboratories. For the first one I selected Professor Lindner's laboratory at the Institut für Gährungsgewerbe in Berlin. Here I spent several weeks studying yeasts and moulds under Dr. Lindner and acetic acid bacteria under Dr. Henneberg. I had free access to a fine collection of cultures, and was thus able to increase our Institute supply very greatly.

Before leaving Berlin, I had a chance to meet the best known of the Berlin bacteriologists, among them Gunster of the Hygienic Institute, several members of Koch's laboratory, also Professor Buchner of the Landwirthschaftliche Hochschule, who discovered the new Euzyme Zymase, which has practically revolutionized our idea of fermentation. I next went to Copenhagen for some lectures and work with Jörgensen, and here visited also several very fine laboratories for practical scientific work, the Carlsberg laboratory under the direction of Professor Hansen being the finest thing of its kind that I have ever seen.

I left Copenhagen on the 4th of July, and on the return trip to Berlin made a tour of inspection of laboratories, meeting in this way Weigmann at Kiel, Wehmer at Hannover, and Reinke at Braunschweig. I next went southward through Germany to Switzerland, travelling for pleasure for the most part, but visiting laboratories when the opportunity offered. In this way I saw something of the Universities of Leipsic, Heidelberg, and Strassburg, and the Polytechnic at Karlsruhe, and visited also such interesting places as Weimar, Eisenach, Nuremberg, and Frankfort-on-the-Main. Near the latter place, on the Rhine, is Geisenheim, with Professor Wortmann's famous laboratory, to which I was fortunate enough to gain admittance, although he was absent. My itinerary also included the Rhine, Switzerland, Paris and the Exposition, and England, and laboratories visited were those of Freudenreich at Berne, the Pasteur Institute, and the laboratories of Cambridge University.

Before reaching Paris, I had travelled entirely alone ; but I met Mr. Smith of the Chemical Department at this place, and the remainder of the summer we spent together in travel and visiting industrial works of various kinds, sailing for home on the 13th of September, after what must be considered in every way a successful and enjoyable summer. I brought back with me a large and valuable collection of cultures of technically interesting organisms for the laboratory of Industrial Biology, and am proud to say that I found no single laboratory giving as comprehensive instruction in this subject as our own, although, as was to be expected, certain men have done much more in special lines.

THE UNDERGRADUATES

ATHLETICS

Mr. Cabot, of the Corporation of the Institute, has offered to provide one medal each in gold, silver, and bronze, for students showing the best physical improvement during the year. He has suggested that the students of the Architectural Department be requested to prepare designs for these medals, and has offered prizes of $15, $10, and $5 for the three most suitable drawings.

The medals are to be approximately the size of a silver half-dollar, and must suggest athletic training, preferably by reference to antique sports or contests. The front is to be entirely decorative in character. The back is to have the name of the Institute, the name of the medal, and space for the full name of the student receiving it.

THE WINTER MEET

The annual indoor meet was held on the evening of December 21st at the Tech gymnasium. The only event in which a record was broken was the shot-put. Here H. T. Winchester, '03, beat out his competitors, and broke the record by a put of 38 feet 7½ inches. This beats the old record by 11¼ inches.

MASSACHUSETTS GENERAL HOSPITAL

Before the meeting held in Huntington Hall on December 20, at which Booker T. Washington, president of Tuskegee College, Alabama, told the students how he secured his education, President Pritchett read the following letter: —

BOSTON, 2 KILBY STREET, November 16, 1900.

DR. HENRY S. PRITCHETT, President:

Dear Sir, — At a meeting of the Trustees of the Massachusetts General Hospital held this day the following preamble and vote were unanimously adopted: —

"In consideration of the very valuable services rendered by the Massachusetts

Institute of Technology, *Voted*, That the Corporation of the Massachusetts Institute of Technology be, and they hereby are, authorized to nominate a student patient to a free bed at the General Hospital at any time during the ensuing five years." I am very respectfully yours,

(Signed) THOMAS B. HALL,
Secretary Massachusetts General Hospital.

LETTER FROM BOOKER T. WASHINGTON

The following letter was received from Mr. Booker T. Washington in acknowledgment of the Christmas gift sent to Tuskegee by the students: —

CRAWFORD HOUSE, BOSTON, MASS., December 23, 1900.

PRESIDENT HENRY S. PRITCHETT, Institute of Technology, Boston:

My dear President Pritchett, — Your check for $60 for the benefit of our institution from your students is a very pleasant surprise to me, I assure you. I had no idea of receiving a cent as the result of my little talk. Please thank all who had a part in making up this gift, and let them know how very grateful I am and how much good it will help accomplish at Tuskegee.

Yours truly,

(Signed) BOOKER T. WASHINGTON,
Principal.

CLUBS AND SOCIETIES

A new society has been formed at the Institute, consisting of the students in the Senior Class who are taking up courses in chemistry and chemical engineering. It is to be known as the Senior Chemical Society. Through the kindness of Mr. Samuel Cabot, a member of the Corporation and of the Visiting Committee for the Chemical Department, informal meetings for the present will be held monthly at his residence on Commonwealth Avenue. He has always taken a great interest in these courses, and it was at his suggestion that the society was organized. The following officers of the society have been chosen: George V. Sammet, president; Edward P. Beckwith, secretary; D. A. Kohr, treasurer.

The Southern Club has been reorganized, and officers elected as follows: president, P. G. L. Hilken; vice-president, R. C. Jordan; secretary, L. G. Wilson; treasurer, M. Cooper; Executive Com-

mittee, J. G. Metcalfe, E. O. Eastwood, and F. T. Taylor. The object is the establishment of an organization whereby Technology news and information may be spread more broadly throughout the Southern States, thus increasing the registration of Southerners at the Institute.

At a meeting of *L'Avenir* held recently the following officers were elected: president, Antonio M. Lage; vice-president, Gustave Bouscaren; secretary, Renaud Lage; treasurer, P. G. L. Hilken; member of Executive Committee, Bertram W. B. Greene. It was practically decided to give a French comedy during Junior Week.

As the result of a meeting, called by Professors Richards and Cross, of the students belonging to the Episcopal Church, there has been formed a society called the St. John's Society.

TECH SHOW

The following circular has been issued in regard to the Tech Show: —

The management of the Tech Show for 1901 take great pleasure in announcing that they have secured from Gilbert & Sullivan's agent in this country the right to perform for a single matinee, with a preliminary public dress rehearsal, an opera by these famous writers which has never before been given performance in America. "The Grand Duke" is in Gilbert & Sullivan's happiest vein, with a quaint and whimsical plot, richly humorous lines, charming songs, and catchy, merry choruses. It gives opportunity for the most varied and picturesque costuming, and will offer as well a variety of striking and interesting dances, including solo dances, duo dances, *danses eccentriques* for seven and ten performers, a very beautiful Greek posing dance, and a full ballet, which will bring the afternoon to a brilliant close. A new Gilbert & Sullivan opera appeals, the management feel sure, to a far wider than college clientèle, as an occasion of genuine artistic interest and importance.

The performance will take place at the Hollis Street Theatre on the afternoon of Friday, May 3, at two o'clock.

The dress rehearsal will take place at the same theatre on the afternoon of Tuesday, April 30, at two o'clock.

Prices of seats for the performance will be $2.00, $1.50, $1.00, 75, and 50 cents. The last-named seats will be in the second balcony only. The prices of seats for the dress rehearsal will be $1.00, 75, and 50 cents. An early application for seats will be necessary to forestall disappointment, as the demand

is already very large. Additional seat blanks may be obtained on application to any member of the Committee, addressing them at the Massachusetts Institute of Technology.

ALLAN WINTER ROWE,
JAMES BRADFORD LAWS,
JASON MIXTER,
For the Committee.

CLASS DAY OFFICERS

The Class Day officers are: first marshal, Francis K. Baxter, Jr., of Utica, N.Y.; second marshal, V. Frank Holmes, of Copenhagen, Denmark; third marshal, William T. Aldrich, son of Senator Aldrich, of Rhode Island; orator, Allan W. Rowe, of Gloucester, and manager for three years of the "Tech Show"; statistician, Percy H. Parrock, of Youngstown, Ohio; historian, Herbert H. Kennedy; prophet, Mortimer B. Foster; Class Day Committee, Robert W. Bailey, Warren I. Bickford, Fred W. Coburn, Leonard S. Florsheim, William W. Garrett, Albert W. Higgins, Harry W. Maxson, Ray Murray, Oliver H. Perry, Jr., Samuel W. St. Clair, Edward Seaver, Jr., William W. Walcott.

"THE TECH"

Walter H. Farmer, '02, has been elected editor-in-chief of *The Tech* in place of H. H. Saylor, resigned. R. B. Pendergast, '02, has been chosen assistant editor-in-chief.

THE GRADUATES

ASSOCIATION OF CLASS SECRETARIES OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Walter B. Snow, Secretary.
Frederic H. Fay, Assistant Secretary.

Members and Class Representatives

'68 Professor Robert H. Richards, Mass. Inst. Tech., Boston, Mass., Secretary.
'69 Mr. Howard A. Carson, 20 Beacon Street, Boston, Mass., Representative.
'70 Professor Charles R. Cross, Mass. Inst. Tech., Boston, Mass., Secretary.
'71 Mr. Edward W. Rollins, 19 Milk Street, Boston, Mass., Secretary.
'72 Professor C. Frank Allen, Mass. Inst. Tech., Boston, Mass., Secretary.
'73 Mr. Samuel E. Tinkham, City Hall, Boston, Mass., Secretary.
'74 Mr. Charles F. Read, Old State House, Boston, Mass., Secretary.
'75 Mr. E. A. W. Hammatt, 53 State Street, Boston, Mass., Secretary.
'76 Mr. John R. Freeman, 4 Market Square, Providence, R.I., Secretary.
'77 Mr. Richard A. Hale, Lawrence, Mass., Secretary.
'78 Mr. Linwood O. Towne, Haverhill, Mass., Secretary.
'79 Mr. Harry H. Campbell, Steelton, Pa., Secretary.
'79 Mr. Edwin C. Miller, 88 Boylston Street, Boston, Mass., Representative.
'80 Professor George H. Barton, Mass. Inst. Tech., Boston, Mass., Representative.
'81 Mr. Frank E. Came, 17 Place d'Armes Hill, Montreal, P.Q., Secretary.
'81 Major Frank H. Briggs, 2 High Street, Boston, Mass., Representative.
'82 Mr. Walter B. Snow, Watertown, Mass., Secretary.
'83 Mr. Harvey S. Chase, 8 Congress Street, Boston, Mass., Secretary.
'84 Dr. Augustus H. Gill, Mass. Inst. Tech., Boston, Mass., Secretary.
'85 Professor E. B. Homer, Mass. Inst. Tech., Boston, Mass., Secretary.

'86 Professor Arthur G. Robbins, Mass. Inst. Tech., Boston, Mass., Secretary.

'87 Mr. Edward G. Thomas, 4 State Street, Boston, Mass., Secretary.

'88 Mr. William G. Snow, 704 Arch Street, Philadelphia, Pa., Secretary.

'88 Mr. Alfred H. Sawyer, care B. F. Sturtevant Company, Jamaica Plain, Mass., Representative.

'89 Mr. Walter H. Kilham, 3 Hamilton Place, Boston, Mass., Secretary.

'90 Mr. George L. Gilmore, Lexington, Mass., Secretary.

'91 Mr. Charles Garrison, Lexington, Mass., Secretary.

'92 Professor Severance Burrage, Purdue University, Lafayette, Ind., Secretary.

'92 Mr. Leonard Metcalf, 14 Beacon Street, Boston, Mass., Representative.

'93 Mr. Frederic H. Fay, 60 City Hall, Boston, Mass., Secretary.

'94 Mr. S. C. Prescott, Mass. Inst. Tech., Boston, Mass., Secretary.

'95 Mr. E. H. Huxley, 185 Lake Street, Chicago, Ill., Secretary.

'96 Mr. F. E. Guptill, 1006 E. Main Street, Richmond, Va., Secretary.

'96 Mr. Edw. S. Mansfield, 3 Head Place, Boston, Mass., Representative.

'97 Mr. John A. Collins, Jr., 55 Jackson Street, Lawrence, Mass., Secretary.

'98 Mr. C.-E. A. Winslow, Hotel Oxford, Boston, Mass., Secretary.

'99 Mr. Walter O. Adams, 1776 Massachusetts Avenue, North Cambridge, Mass., Secretary.

'00 Mr. George E. Russell, Mass. Inst. Tech., Boston, Mass., Secretary.

President of Senior Class, Mr. Ellis F. Lawrence, Mass. Inst. Tech., Boston, Mass.

Representative of Institute Committee, Mr. I. Rayne Adams, Mass. Inst. Tech., Boston, Mass.

President of Technology Club, Mr. James P. Munroe, 179 Devonshire Street, Boston, Mass.

Secretary of the Institute, Dr. Harry W. Tyler, Mass. Inst. Tech., Boston, Mass.

President of Alumni Association, Mr. Charles T. Main, 53 State Street, Boston, Mass.

Secretary of Alumni Association, Professor Edward F. Miller, Mass. Inst. Tech., Boston, Mass.

Persons to whom Reports are Regularly Sent

President Mass. Inst. Tech., Dr. Henry S. Pritchett, Mass. Inst. Tech., Boston, Mass.

Member Publication Committee Technology Review, Mr. Walter Humphreys, 71 Newbury Street, Boston, Mass.

Secretary and Treasurer of the N. W. Association, Mr. E. M. Hagar, 1060 The Rookery, Chicago, Ill.

Secretary and Treasurer of Western Association, Mr. Frank E. Shepard, 924 Washington Avenue, Denver, Col.

Secretary and Treasurer M. I. T. Society of New York, Mr. Alex. Rice McKim, 106 East 23d Street, New York.

Chairman Executive Committee Connecticut Valley Association, Mr. N. P. Ames Carter, Carter Electric Company, Springfield, Mass.

Secretary and Treasurer of Technology Society of Philadelphia, Mr. Samuel S. Sadtler, 336 W. Franklin Street, Germantown, Philadelphia, Pa.

Secretary Pittsburg Technology Association, Mr. F. S. Vielé, 618 Westinghouse Building, Pittsburg, Pa.

Secretary-Treasurer Tech. Society of Western New York, Mr. Henry A. Boyd, 125 Erie County Bank Building, Buffalo, N.Y.

Secretary Washington Society of the M. I. T., Mr. A. W. Proctor, 1431 Rhode Island Avenue, N.W., Washington, D.C.

NORTH-WESTERN ASSOCIATION

Alumni of the Massachusetts Institute of Technology held their annual banquet at the University Club March 16. More than a hundred members of the North-western Association and their friends were gathered about the tables. Among the guests were President Henry Smith Pritchett of the Institute, Secretary of the Treasury Lyman J. Gage, former President Frank W. Gunsaulus of Armour Institute of Technology, and Martin B. Madden. It is the custom of the alumni to have some novel feature at the annual dinner, and this was no exception. Shortly after the guests were seated, a dozen newsboys burst into the banquet hall, crying: "Extra! All about the banquet of the 'Techs'!" The *Evening Journal* had printed a "midnight edition," giving a graphic account of the banquet, under a seven-column head-line across the first page. The

three centre columns of the first page told all about "What they ate" and "What they said." The papers sold like hot cakes. Another feature was an electric illumination of the permanent shield, representing the Massachusetts Institute of Technology, which adorns the banquet hall of the University Club, and under it the name "Pritchett" in electric letters.

I. W. Litchfield, president of the North-western Association of Alumni, was toastmaster.

Dr. Gunsaulus, the first speaker, declared that the Massachusetts Institute of Technology was the first institution to put the ideal into practice. "This ideal," he said, "is the training of mind, heart, and hand together to make the perfect man." He expressed the gratitude of the Armour Institute of Technology to the "mother of all technical schools," and told how, after a visit to the Boston Institution, Mr. Armour gave an extra $1,000,000, and changed the name from "Manual Training School" to Institute of Technology.

Secretary Gage spoke briefly on the subject of "Trained Men in the Government Service," declaring that the men whom he had found most capable of attending to government business usually were those who had enjoyed a technical education. He urged that men be trained for the affairs of the world as well as for local affairs.

President Pritchett gave an admirable address, bringing greetings to the North-western Alumni Association, University of Chicago, and to the Armour Institute of Technology. Incidentally, he outlined the plans for the Walker Memorial Gymnasium; and as a result of this, and of speeches by Solomon Sturges, '87, and other alumni, the sum of $4,000 was immediately raised.

Officers for the ensuing year were elected as follows: president, I. W. Litchfield; vice-president, E. L. Andrews; secretary and treasurer, E. M. Hagar; Executive Committee, A. P. Hall, Van Rensselaer Lansing, W. G. Zimmerman.

At the January 16 meeting, Mr. W. N. Selig gave an exhibition of his polyscope. Dr. W. S. Christopher, who is well known because of his specialty, child study, described the instruments used

for indicating the physical and mental condition of children. Dr. Mortimer Frank, who was in charge of the Chicago American's Galveston relief expedition, told some of his interesting experiences. There was also a short description of a new pulsometer, by its inventor, Mr. M. G. Stolp, city engineer of Aurora, Ill.

CLEVELAND, OHIO

The Cleveland graduates of the Institute entertained President Pritchett at the University Club on Prospect Street March 7, and tendered him there a banquet and reception. The Toledo graduates of the famous Massachusetts technical school also assisted in receiving the guest of honor. Following a banquet in the club's dining-room, Professor Pritchett spoke to the graduates and to invited guests on the work being done to-day at the Massachusetts Institute of Technology, and compared it with the work that had been done there in past years.

The toastmaster at the banquet was Mr. James Ritchie, and those who responded to appropriate toasts were the following: Dr. Cady Staley, President Charles F. Thwing, and J. H. Clark.

There were about forty-six present, and among the older graduates or former members were: Kimball, Leman, and Johnston of '73; Blunt of '74; Handy of '75; Ritchie of '76. There were as guests Drs. Staley and Thwing; the Hon. John H. Clarke, general solicitor of the New York Central and St. Louis Railroad; Colonel Mansfield, United States engineer office; four or five prominent Cleveland business men; three educators; and a few prominent lawyers and professional men, including the director of public works and the director of law of our city administration.

EXTRACT FROM THE KANSAS "CITY TIMES," MARCH 14, 1901

President H. S. Pritchett of the Massachusetts Institute of Technology was entertained at dinner last night at the Kansas City Club by a number of prominent citizens of Kansas City, including graduates of the Institute of Technology.

President Pritchett spoke informally concerning the work of the Institute of

Technology, which is now perhaps the greatest scientific school in the country. He described the work of the departments in various lines of engineering and architecture, the tests in the laboratories of high temperature, and other details of recent work, and alluded to the necessity for trained men in commerce in order to meet the demands of modern conditions.

He referred to the plan just inaugurated in the Institute of Technology for physical culture. This plan contemplated the examination of the physical condition of every student entering the institution, and the direction of that student in the proper care of his body. President Pritchett stated most clearly that this plan did not contemplate the establishment of expensive and time-consuming sports. The Institute, said he, is a place where men come for serious work, and in this work they find full occupation; and some of the competitive games have become occupations rather than games. Football, in many cases, he said, was rather an occupation than a game.

President Pritchett spoke to the students of the Central and Manual Training High Schools yesterday morning. He said at the manual training school, where he made an address at 8.30 o'clock, that the American engineers were doing work no other engineers had ever done or could do. This is because American teachings are not hampered by traditions. Men from every country are coming to America to study engineering, he said. He urged an early outlining of life's duties or work, which, he said, was the best and easiest way to succeed.

It was eleven o'clock when Dr. Pritchett and J. L. Lombard, whose guest he was, reached the Central High School. The fourteen hundred students were at their regular assembly, and greeted the speaker with hearty applause. He spoke for a short time, his address being listened to with the greatest attention.

WASHINGTON SOCIETY OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

The following extract is from a letter received from A. W. Proctor, secretary: —

. . . The Washington society, thanks to the well-directed and able management of its first executive corps, and especially to the ex-secretary and prime-mover, Mr. R. E. Bakenhus, '96, to whom too much credit cannot be given, has now its foundation stones fully laid, and has become a permanent and serious organization for the accomplishment of certain determined lines of work. During the past year five meetings have been held, during which time it has had the honor to entertain President Pritchett, of the Massachusetts Institute of Technology, then superintendent of United States Coast and Geodetic Survey; Mr. Alexander Graham Bell, of telephone fame; First Lieutenant John Stephen Sewell, Corps of Engineers; Major Josiah Pierce, major of engineers on the

staff of General Fred Grant; Mr. Herman Hollerith, inventor of census tabulating machine; and many others equally distinguished. These facts show the general idea and purpose of the society, not casual speech-making,— for, as ex-President Newell remarked at the December 18th meeting, "Oratory, unfortunately, was not taught at the Institute, and that is too far north for the product to be indigenous," — but to come together and tell or hear something of special or scientific interest, and incidentally become acquainted for the promotion of our mutual welfare and that of the Institute. In the coming year it is the purpose of the society to increase its activity in the above and other lines; and all Tech men coming to Washington are invited to correspond with the secretary, Mr. A. W. Proctor, 1431 Rhode Island Avenue, N.W., with a view to entering the society.

M. I. T. SOCIETY OF NEW YORK

Forty of the Massachusetts Institute of Technology alumni met at dinner at the Arts Club February 9. President Pritchett, of the Institute, was unable to be present on account of sickness.

The board of management for the year was elected as follows: Alexander Rice McKim, secretary and treasurer; C. D. Pollock, H. D. Hibbard, Charles A. Meade, and Azel Ames, Jr., Executive Committee.

C. A. Meade acted as toastmaster. Professor William T. Sedgwick spoke on technical education. Professor Michael Pupin presented interesting details about his invention of the submarine telephone.

THE TECHNOLOGY CLUB

Immediately after the annual concert of the Glee, Banjo, and Mandolin Clubs, on the evening of December 11, the Technology Club gave a reception to the members of these clubs and their friends. Mrs. William B. Rogers and Mrs. Francis H. Williams were matrons for the evening. On December 18 the third smoke talk was given by Mr. G. H. Wright. Club members were amused and entertained by his "Rambles in North Africa," illustrated by excellent stereopticon pictures.

Immediately before this talk a business meeting was held to revise the by-laws, principally to the effect that the president and vice-president should be elected by the club at large instead of,

as formerly, at the meeting of the council held immediately after the annual meeting.

Dr. Hasket Derby, on January 8, told of "A Visit to a Dead City in the Baltic." Many interesting stereopticon slides were shown. The reception to the first-year students, to be given by the President of the Institute and members of the Faculty, was planned for the evening of January 9. The students were to have the chance of meeting the heads of the various departments, in order that they might more intelligently, perhaps, choose their professional course to be taken at the Institute. Unfortunately, however, because of President Pritchett's illness, the reception had to be given up. On January 18 Mr. George W. Cable gave a reading: "Posson Jone." Ladies were invited to this talk; and the demand for tickets, as for the other ladies' nights, was much greater than the supply. Many members who asked for tickets even in good season had to be refused, in order that the seating capacity of the common room should not be overtaxed, and that the members and their friends who were present might be entertained comfortably. Professor Chandler gave an interesting smoke talk on "An Architect's Visit to the Paris Exposition" on January 29. His professional criticism of the Exposition was most instructive. The seventh talk, on February 5, was given by Professor Adolph Cohn, whose subject was "Modern French Politics." After the talk, which was enjoyed by the members present, an interesting discussion took place. The second ladies' night of the season was on February 19, at which Mr. Leland Powers enacted "David Garrick." Mr. Powers's impersonation of the characters was so perfect that the audience quite forgot that there was but one actor. On February 26 Captain Dion Williams, of the United States Marine Corps, gave his personal experiences of the battle of Manila Bay and the subsequent events in the Philippines as experienced by him while on the "Baltimore" and "Oregon." On March 19 Major John Twiggs Myers gave a talk, "With the American Marines in Pekin." At both of these talks unusual interest was shown by the large numbers present, and the intelligent relation of recent historical events was most keenly appreciated.

On the evening of March 26 the club authorized the council to incorporate the club for the purpose of being able to buy the house at No. 83 Newbury Street. The council is glad to report that incorporation has been effected, and that this house will immediately be adapted to the needs of the club.

President Hadley, of Yale University, spoke to a large number on the evening of March 12, and gave "Reminiscences of the late President Walker." His talk was all too short.

Through the whole season the attendance has been larger than at the talks of any of the previous years. The attendance at lunch and at dinner shows a marked increase, and more of the members are using the reading-room during the evenings. All this shows that the club is being more availed of and appreciated by its members.

TECH ALUMNÆ ASSOCIATION

The first annual meeting of the Association of the Women of the Massachusetts Institute of Technology was held Saturday afternoon, December 29, 1900, in the Margaret Cheney room. Mrs. Henry S. Pritchett, Mrs. William B. Rogers, Mrs. Edna D. Cheney, Miss Laura B. White, and Miss Pike were the guests of honor. The following is the list of officers elected: president, Ellen H. Richards, '73; vice-presidents, Mabel W. Sawyer, '94, and C. Belle Kenney, '86; recording secretary, Nettie M. Willey, special; corresponding secretary, Sarah H. Bonesteele, '94; treasurer, Isabel F. Hyams, special; auditor, Matilda A. Fraser, '89; Executive Committee, Alice B. Tyler, Lillie M. Kendal, Mabel D. Clapp, together with the officers of the Association.

NEWS FROM THE CLASSES

1868.

PROF. ROBERT H. RICHARDS, *Sec.*
Mass. Inst. of Technology, Boston.

Six members of the class were present at the annual meeting of the Alumni Association; namely, Eli Forbes, Albert F. Hall, William Jackson, Robert H. Richards, Eben Stevens, and James P. Tolman.

1872.

PROF. C. FRANK ALLEN, *Sec.*
Mass. Inst. of Technology, Boston.

C. F. Allen has recently passed the examination, and been admitted to the bar of Massachusetts. He practised law for a short time in New Mexico, where he was the local attorney of the A., T. & S. F. R.R. Co. at Socorro, where he was also elected city attorney.— Bradford H. Locke has the good fortune to be minus his "appendix" after a thoroughly successful operation. He is in Hartford at present, looking after the electric drill which he has invented.— Mr. James R. Chapman, electrical engineer for the Chicago Union Traction Company and the Lake Street, Union, and North-western Elevated roads, has resigned from that position, his resignation taking effect March 1. Shortly after that date Mr. Chapman will sail for London, where he will take charge of the electrical features of Mr. Yerkes's projects there. Mr. Chapman has been engaged in electric railroad work since 1888, having gone to Kansas City in that year. In 1891 he rebuilt the cable and horse lines of Grand Rapids, Mich. Since 1894 he has been intimately connected with the street railways of Chicago.

1874.

CHARLES F. READ, *Sec.*
Old State House, Boston, Mass.

The annual reunion of the Association of the Class of 1874, M. I. T., occurred at the Technology Club on January 16, 1901, and was attended by a large number of members. There was much disappointment expressed at the enforced absence of President Pritchett by illness, as he had accepted an invitation

to be present. The following officers were elected for the current year: president, Willis R. Russ; vice-presidents, George H. Barrus and John C. Chase; secretary and treasurer, Charles F. Read.— Harold W. Stevens, of Hartford, Conn., attended the class reunion in January for the first time in several years.— William B. Dowse, of New York, called recently on the secretary, while on a visit to Boston.

1875.

E. A. W. HAMMATT, *Sec.*

53 State Street, Boston Mass.

The annual meeting of the class was held at Young's Hotel, January 11, 1901, at 7 P.M. The records of the last meeting were read and approved, and also the reports of the secretary and treasurer. It was voted to amend Article VII. of the Constitution, so that it shall read: The regular Annual Meeting of the Society shall be held between January 1 and April 1, the date being fixed by the Executive Committee. The question of publishing a Class Directory was laid on the table until the next meeting. The ballot for officers resulted in the election of the old board.— F. T. Sargent was with us at this meeting, the first time for over fifteen years.— It is reported that Welland F. Sargent has returned to Chicago.— R. J. Dustan is said to be at Palo Alto, Cal.— Frank Dabney is assistant treasurer of the Seattle Electric Company, Seattle, Wash.— William C. Edes was married January 31, 1901, to Mary Burnham, of Berkeley, Cal.— The secretary would like to secure complete files of the *Spectrum*, the paper published by '75 while at the Institute, and of which Number One, Volume One, bears date "February 22, 1873." This is believed to have been the first paper published at the M. I. T.; and, if any one has either complete files or any numbers of the paper, if he will kindly notify the secretary, and state just what they are, it will be appreciated.

1876.

JOHN R. FREEMAN, *Sec.*

4 Market Square, Providence, R.I.

Charles F. Allen has married, and is living quietly and enjoying life in a very pleasant cottage by the sea at South Duxbury, Mass., "Sunny Knoll." Water on

three sides and historic grounds all about. Because of the disinclination of his wife and himself for the discomforts surrounding the life which he formerly followed as a mining engineer in the Far West, he has for some years past given up the active pursuit of his profession. — Charles N. Waite has recently returned from Crawford, N.J., to Boston, and at last accounts was hard at work perfecting some of the chemical processes of the Cellulose Products Company.

1877.

RICHARD A. HALE, *Sec.*

Lawrence, Mass.

The annual dinner and reunion of the class of '77 was held at Young's Hotel, February 18, 1901, sixteen members being present. H. C. Southworth was elected president; F. E. Peabody, vice-president; and R. A. Hale, secretary and treasurer. Arrangements are to be made by the officers of the class for the twenty-fifth anniversary, which occurs next year. Among the members who have not attended for some years was E. G. Taber, who has spent most of his time on railroad surveys and construction through the State of Washington, and is now spending the winter East. F. W. Wood, the president of the Maryland Steel Company, was present, having spent the day in the examination of the Gas and Coke Works at Everett, and took the midnight train for Maryland. The works at Sparrow's Point are very busy in constructive work, building, as already noted, large freight steamers besides smaller boats. A large viaduct in Burmah, India, has recently been constructed by them. Others present were: Arthur L. Plimpton, chief engineer of elevated lines, Boston Elevated Railway; Walter Jenney, of Jenney Manufacturing Company; Harry C. Southworth, who is engaged on Railroad Commission on Abolition of Grade Crossings; John Alden, chemist of Pacific Mills; Henry H. Carter, consulting engineer; and many others. A letter was received from E. C. Woodward, who is located at Denver, Col., engaged in assaying. Mr. Williston, a former member of '77, now connected with the Hancock Inspirator Company, was present at the meeting, and welcomed by all. The subject of the

Walker Memorial Fund was discussed, and $115 subscribed by some members present.— R. A. Hale has just been reappointed member of the Lawrence Park Commission for five years. He had been on the board for several years, and was chairman during the past year. — Professor G. F. Swain has recently been elected a director of the national engineering organization, the American Society of Civil Engineers. He has also been appointed, not long since, a member of the commission for the abolition of grade crossings at Worcester.— G. W. Kittredge has been elected president of the American Railway Engineering and Maintenance of Way Association, being the second president of this young but prominent and important society. He is at present the chief engineer of the "Big Four" Railroad System.

1878.

LINWOOD O. TOWNE, *Sec.*

Haverhill, Mass.

The class held its annual reunion and supper at Young's the last evening of the closing century. President Baker was, as usual, at the head of the table; and the evening was spent in the accustomed informal manner. Those present, besides the president, were Bradford, Higgins, Rollins, Sargent, Schwamb, Williams, and Towne.— The secretary has recently heard, after many years of silence, from Will W. Adams, who has married and is now living at 400 Van Ness Avenue, San Francisco. He seems desirous of hearing from any of the class, and his letter shows every evidence of no change in the spirit of the cordial fellow we knew so well years ago. His work in San Francisco is as general consulting mining engineer, with special reference to gold properties.— Nichols, who has been for some time employed as one of the superintendents of the Massachusetts State Highway Commission, has of late been located in Haverhill, attending to bridge and other construction work on a new piece of State road between Haverhill and Lawrence.

1879.

HARRY H. CAMPBELL, *Sec.*

Steelton, Pa.

John W. Cabot, formerly assistant superintendent Cambria

Iron Company, has been travelling in Europe since last September, studying European conditions and methods. He will visit the steel centres in England, Germany, Austria, Belgium, etc., before his return, and expects to take up expert work on his return to this country.— Professor William H. Pickering, the astronomer, is at present located at Mandeville, Jamaica. He is engaged on photographic work in connection with observations on the moon, and expects to publish a large atlas of eighty plates later. He is using the longest telescope in active work that has ever been used, being one hundred and thirty-five feet in length.— The following members of the class have become associate members of the Alumni Association: Frank E. Alden, of Alden and Harlow, architects, Pittsburg, Pa.; George F. Blake, Jr., of the firm of George F. Blake, Jr., & Company, Worcester, Mass.; Alfred B. Harlow, Alden & Harlow, architects, Pittsburg, Pa.; Louis P. Howe, with S. H. Howe Shoe Company, O. H. Stevens Manufacturing Company, Marlboro Electric Company, Marlboro, Mass.; Charles L. Fellows; Henry Bryant.— There has been published recently, by the Commonwealth of Massachusetts, a very interesting and enlightening history of the development of street railways in Massachusetts, of which Walter S. Allen is the author. The value of the pamphlet is increased by an excellent map, showing the existing street railways in the State.

1881.

FRANK E. CAME, *Sec.*

17 Place d'Armes Hill, Montreal, P.Q.

The class will have a reunion dinner this year, it being the twentieth anniversary of graduation.— Permanent Secretary Frank E. Came invests his surplus income in a stock farm in New Brunswick.— Dr. John Duff invests his in his wife's successful campaign for membership in Boston School Committee.— Honorable Frank W. Rollins, ex-Governor of New Hampshire, gave a dinner to his military staff at the Lenox in February.

1882.

WALTER B. SNOW, *Sec.*
Watertown, Mass.

The secretary has been diligently seeking the address of Frank C. Morrison. Healy, Tibbetts & Co., engineers and contractors, San Francisco, Cal., by whom he was supposed to have been formerly employed, report that they know nothing of him.— Some years ago Mr. F. E. Kidder wrote a book on ecclesiastical architecture, which has been out of print for some time. It has recently been revised, and is now published in attractive form under the title of "Churches and Chapels: Their Arrangements, Construction, and Equipment." The book is published by William P. Comstock, New York, at $3.00.— The nineteenth annual dinner of the class occurred at the Technology Club on Thursday evening, February 7. Gooding, Darrow, Herrick, Munroe, A. W. Walker, Warren, and W. B. Snow were in attendance. The Walker Memorial was discussed, and subscriptions therefor increased.— The address of Joseph H. Walker is now Box 462, Los Angeles, Cal.— Rev. E. A. Manning, father of Harry G. Manning, died at Reading, Mass., February 5, at the advanced age of eighty years.— George F. Chapman, president of the Neponset Land and Live Stock Company of Evanston, Wyo., has been spending part of the winter in the East, with headquarters at 16 Revere Street, Jamaica Plain, Mass.— Thomas B. Carson was recently elected vice-president of the National Association of Agricultural Implements and Vehicle Manufacturers, an association which represents a combined capital of $170,000,000, employs eighty-five thousand men, and does a shipping business of four hundred million tons per year.— George W. Mansfield's present home address is 80 St. Botolph Street, Boston.— Francis P. Hall of Emporia, Kan., spent a portion of the winter at Powder Point, Duxbury, Mass.— Walter B. Snow was recently re-elected park commissioner of Watertown, Mass.— The business address of Frederick B. Cochran, stock broker, is now 20 Broad Street, New York, N.Y.— Harry G. Manning has recently completed the design and installation of a 1,000 horse-power power plant, and has superin-

tended erection of rolling-mill for manufacture of steel at the works of the Simonds Manufacturing Company, Chicago, Ill.— Robert Bonney Herrick, son of Mr. and Mrs. Rufus F. Herrick, was born May 4, 1900.— A recent issue of the *New England Magazine* contained an article by James P. Munroe on "The Destruction of the Convent at Charlestown, Mass., 1834." Munroe has been busy during the past winter speaking before various school and similar organizations on matters pertaining to education. On April 26 he gives an address at Moline, Ill., before the Northern Illinois Teachers' Association. He has recently published, through George H. Ellis, a little book of eighty pages, entitled "A Sketch of the Munro Clan, also of William Munroe, who, deported from Scotland, settled in Lexington, Mass., and of Some of his Posterity, together with A Letter from Sarah Munroe to Mary Mason, descriptive of the Visit of President Washington to Lexington in 1789."— On December 18, classes '82, '83, and '84 had a very pleasant informal reunion at the Technology Club. Seated at one long table, they partook of a regular club dinner, and then listened to a "Smoke Talk" given on that evening by G. H. Wright. About twenty were present.

1883.

HARVEY S. CHASE, *Sec.*

8 Congress Street, Boston.

The following is an extract from a letter received from H. Ward Leonard, December 17: "I am still making rheostats of all kinds, and automatic circuit breakers, and have about thirty patents in these lines, some of which cover features which have proved commercially of great value. At the Paris Exposition I was awarded a gold medal, which was the highest award open to goods such as mine. I was in competition with hundreds of concerns from the various countries, and no other concern in the world got such a high award as a gold medal. As to my method of control: it is still used exclusively by the navy for turret turning; and its applications extend slowly, but surely. Nearly all of the leading electric companies are licencees now, and I get a very good return

from the royalties. I found that my system was in use for starting the moving platform at the Paris Exposition; and its very successful use there enabled me to dispose of my French patent for cash plus a royalty to a large concern of very large capital, who are devoting their energies to electric locomotives. They have already built and tested one of my locomotives, and are now building three more. So I hope that my expectations as to my locomotive may still be realized." . . .— H. S. Chase has recently published his Report to the Mayor of Boston on the Printing Department. It is a pamphlet of eighteen pages, which goes very fully into the management and book-keeping of this much discussed department.

1884.

Dr. Augustus H. Gill, *Sec.*
Mass. Inst. of Technology, Boston.

The class held its twentieth annual meeting and dinner at the Technology Club on February 21, 1901, the following being present: Appleton, Bardwell, Bennett, Damon, Gill, Mellen, Puffer, Rotch, and Ward. No quorum being present, no business could be transacted. Letters were read from absent members, and reminiscences indulged in.— Damon is in the insurance business in New York. While there, he has met Kennard and Price, whom some of us may remember as having been with the class during its first year. Price is president and general manager of the Runskool Metal Company at 13 Cedar Street, New York.— Purinton is general manager of the Palmer & Monson Street Railway Company and the Central Massachusetts Electric Company at Palmer. They are controlled by the "Young Syndicate," and are building an electric road to Springfield.— Weston, since Eagan's retirement, is commissary general of subsistence, and is always glad to see any "Tech" men at his office in the War Department.— Ward was with us once again after an absence of six years abroad, a year and a half of which were spent in Copenhagen and the remainder in Germany. His address is 49 Homestead Street, Roxbury, Mass.— Haines is general manager and treasurer of the Fort Worth (Tex.) Street Railway Company.— Tyler spent his

well-earned vacation at Jackson, N.H.— The class was unusually well represented at the alumni dinner, eleven members being present. $1,915 has been raised for the Walker Memorial. — C. L. Adams had four pictures at the New Gallery exhibit Copley Hall, one at the Boston Art Club, and two at the Pennsylvania Academy of Fine Arts.

1885.

PROF. E. B. HOMER, *Sec.*

1 Somerset Street, Boston.

John M. Kimball, class president, announces a partnership under the name of Kimball & Townsend. His firm has been recently appointed general agents of the Equitable Life Association Company for Eastern Massachusetts.— Eleazer B. Homer, architect, announces the removal of his office from the Tremont Building to larger quarters in the Old Congregational House, No. 1 Somerset Street, corner of Beacon Street.

1886.

PROF. ARTHUR G. ROBBINS, *Sec.*

Mass. Inst. of Technology, Boston.

From the *Transcript*, February 25: "Strong, original, and artistic as was Charles H. Woodbury's exhibition of last year, that of the present season excels it in strength, originality, and artistic quality. . . . In Mr. Woodbury's marine pieces there is something of the same hearty, spontaneous, and ardent love of the sea that we find expressed in the free and swinging lines of 'Childe Harold.' The painter, like the poet, was born and brought up close to the seashore; and he never found his vocation until he began to paint the ocean. Few painters have painted it as well as he, none better. . . . The variety of the collection is little less than amazing: it ranged through all seasons, all kinds of weather, and all the phases of nature on sea and shore."

1887.

EDWARD G. THOMAS, *Sec.*

4 State Street, Boston, Mass.

The annual meeting of the class of '87 was held at Young's Hotel on the evening of February 20, the following members being present: Bryant, Hussey, Adams, Gay, Spaulding, Cumnock, Brett, Taintor, Cameron, Coburn, E. G. Thomas, Cooley, and W. A. Whitney. As Pres-

ident Wakefield is at present in Europe, Vice-President Bryant presided. The following officers were elected for the ensuing year: president, Bryant; vice-presidents, Haskell and Whitney.— Maurice W. Cooley, after quite a term of service as captain of volunteers in the United States Army, has settled in Boston for a time, in charge of the work of the National Contracting Company. Mr. Cooley saw service in Cuba, and was the first American officer to be seen in Matanzas after the war. General Greene, who was his chief in the service, is at the head of the company with which he is connected at present.— Messrs. G. O. Draper and T. W. Sprague are now in Arizona, visiting Mr. Draper's mining properties.— Gelett Burgess is in San Francisco, and can be addressed in care of the Bohemian Club.— H. S. Adams spent two weeks of February in Florida, reporting on a phosphate property in the lower part of the State.— Giles Taintor has been admitted to the Suffolk County bar, and is ready for cases from '87 men or others.— " Mr. William Channing Cushing has been appointed superintendent of the Pittsburg Division of the Pennsylvania Lines west of Pittsburg, succeeding Mr. George L. Peck, Mr. Cushing's former position having been that of engineer of maintenance of way at Pittsburg. He was born March 18, 1863, at St. John, N.B., and educated at the University of New Brunswick and at the Massachusetts Institute of Technology. He entered railroad service in 1887, and has been continuously in the engineering department of the Pennsylvania or subordinate lines ever since. Mr. Cushing was elected a Junior of the American Society of Civil Engineers in 1889 and an Associate Member in 1891. He has long been recognized as one of the coming men of the Pennsylvania system. " — *Railroad Gazette*, Jan. 4, 1901.

1888.

WILLIAM G. SNOW, *Sec.*

704 Arch Street, Philadelphia, Pa.

The annual class dinner was held at the Technology Club March 23, too late for a detailed account to appear in the April REVIEW.— Ellison C. Means has removed from Ashland, Ky., to

Low Moor, Va., where he is president and general manager of the Low Moor Iron Company.— Stone & Webster have found it necessary to add another floor to their already large office space at 93 Federal Street, Boston.— George C. Scales is at San Juan, Porto Rico, in charge of work for the Massachusetts Construction Company. At present they are building a club house and a pavilion for a street railway, while waiting for materials to come from New York for the docks to be constructed at Ponce.— Odin B. Roberts has formed a copartnership with Mr. Robert Cushman under the firm name of Roberts & Cushman, with offices at 95 Milk Street, Boston. They are specialists in patents, trade-marks, and copyrights.— Henry C. Moore is connected with the *Horseless Age*, 150 Nassau Street, New York, N.Y.— J. A. Gammans is with the Chicago agency of the American Thread Company of New York.— The Consolidated Machine Specialty Company, of which Arthur S. Williams is secretary and treasurer, has removed to 152 Purchase Street, Boston.— Richard Devens has returned from abroad, where he represented the Brown Hoisting Machinery Company, incorporated, of Cleveland, Ohio, and is now at the home office.— Thomas R. Kimball, architect, is in the McCague Building, Omaha, Neb.— William G. Snow has leased a house at 6305 Sherwood Road, Overbrook, Philadelphia, Pa.— T. A. Foque, assistant mechanical superintendent of the Minneapolis, St. Paul & Sault Ste. Marie Railroad, has been appointed mechanical superintendent. Foque for some time has been secretary of the North-west Railroad Club. He has recently been made president.— Miss Annie Graham Rockfellow, architect, is now located at Mount Morris, N.Y., having removed from Tucson, where she was instructor in the University of Arizona. — T. F. Laist designed the Government Building at the Pan-American Exposition that is to be held in Buffalo this spring.— On March 1 the subscriptions to the Walker Memorial amounted to $3,045. Let others come in as soon as possible.— The following letter from the *Dial*, April 1, relates to the father of Stejiro Fukuzawa : —

THE GRAND OLD MAN OF JAPAN.

By the death of Mr. Yukichi Fukuzawa, Japan has suffered the loss of one of its truly great men. From the fact that he lived in the Mita District of Tokyo, he was generally called the "Sage of Mita"; but he was often called "the grand old man of Japan." He was one of the early Japanese students of Dutch and English. In 1858 he came from Nagasaki to Yedo, and opened a school which was the nucleus of the great institution now known as the Keiogijiku, with academic, collegiate, and university courses. This school was not closed during the Revolutionary War. Even during the battle of Nyeno (1869), his school continued in session in another section of the city, and his students were studying Wayland's "Moral Science." From this school have gone forth hundreds of able young men who have distinguished themselves in all departments of life. As the Japan *Times* says, "It was in this school and under the eye of its great master that the art of public speaking was first practised. In fact, the Japanese word for a public speech (oration), now so generally used, was coined by Mr. Fukuzawa himself. He may, indeed, be called a great educator, or teacher." In 1882 he established a daily paper called *Jiji Shimpo* (*News of the Times*, or *Times*), which holds in Japan the same prominent place that its namesakes hold in London or New York. Although in certain points that paper may be surpassed by some contemporary, yet it is, on the whole, what it claims to be, "the No. 1 daily of Japan." The editorials by Mr. Fukuzawa could always be recognized by their simple, clear, and forcible style, and their instructive and elevating tone. In view of the influence of his journal, he may again be called a great educator, or editor. With reference to his style of writing, it should also be noted that he shares with Mr. Fukuchi "the honor of having introduced what may be called the natural style in Japanese literature as distinguished from the stilted Chinese style." He was a prolific writer: his total output is said to have been "fifty different kinds of books, comprising one hundred and five volumes." (It must, however, be understood

that a Japanese "volume" is rather small.) His writings were principally on social, political, and moral topics, and have wielded a powerful influence in Modern Japan. For instance, he "did more than anybody else to emancipate the fair sex from the restraints of the old-fashioned code of morality by the publication of his 'Criticisms of Kaibara's Great Learning for Women' and his own 'New Great Learning for Women.'" From a third point of view, therefore, he may be called a great educator, or author. He might have been Minister of Education or have received a patent of nobility; but he refused public office and despised titles, except such as "the great commoner," which was sometimes conferred upon him. His life was pure and blameless, and his moral teachings were of the loftiest type. He practised what he preached, so that he was once more a great educator, or exemplar. The Japan *Mail* says of him: "As a leader of the new civilization, it would be difficult to overrate the benefits conferred by him on his country." "He is described as the great motive force of Japan's modern civilization; the man who did more than all his contemporaries to promote the spread of a spirit of true liberalism." Whether as teacher, editor, essayist, author, or moralist, Mr. Fukuzawa deserves the highest rank among the "men of letters of New Japan."

ERNEST W. CLEMENT.

TOKYO, February 18.

1889.

WALTER H. KILHAM, *Sec.*
3 Hamilton Place, Boston, Mass.

D. P. Goodrich is practising architecture at Hartford, Conn. — Montgomery Rollins is a banker and broker, with office in the Brazer Building, State Street, Boston.— A. L. Williston is director of the Department of Science and Technology, Pratt Institute, Brooklyn, N.Y.— E. E. Pierce is connected with the State Survey, with headquarters at 138 State House and residence at Belmont. The re-running of the New York-Massachusetts and Massachusetts-Rhode Island lines has just been completed.— Frank E. Sanborn was married January 1, 1901, to Miss Elizabeth Champney Hunneman, at Dorchester, Mass.— F. R. Hart and H. H.

Howard are charter members of the new Automobile Club in Boston.— The following men attended the last alumni dinner at the Hotel Brunswick: Hobbs, Thurber, Fiske, W. S. Johnson, W. L. Smith, Kilham, Spaulding, Kunhardt, E. V. French, Underhill, Hollis, C. G. Norris, Williston, and W. W. Lewis. '89's subscription to the Walker Memorial was given a substantial lift at that time.

1890.

GEORGE L. GILMORE, *Sec.*
Lexington, Mass.

Rev. Willard H. Roots was in Boston last June, and after a short visit with his family at Little Rock, Ark., returned to Chelan, Wash., where he has been engaged in active missionary work for several years. Mr. Roots has done a great deal of good in the region where he is located, and through his personal efforts a substantial log church has been built. His district covers a large extent of territory, requiring constant travel on his part, as he preaches in several places many miles apart.— Elizabeth E. Bickford is engaged in private teaching; and her address is 154 Newbury Street, Boston, Mass.— C. V. Carleton is with the Metis Lumber Company of Price's, Grand Metis, Province of Quebec.— S. D. Flood is general manager of the Macon Shear Company of Macon, Ga.— F. W. Swanton is engaged in private business. His present address is 1 Regent Street, Roxbury, Mass.— H. B. Roberts is resident engineer of the New York Rapid Transit Subway Construction Company. His address is 21 Park Row, New York, N.Y.— Professor W. Z. Ripley was one of the speakers at the annual meeting of the American Economic Association held at Detroit, December 27, 1900. He has recently been appointed expert in transportation of the United States Industrial Commission.— George A. Packard has been spending the winter in the East, making his headquarters at the old home in Wakefield.— Professor George E. Hale gave a very interesting lecture before the Society of Arts, January 31, in Boston, describing the big Yerkes 40-inch telescope and showing the difficulties met with in using the same as a camera. — H. P. Spaulding gave a very successful exhibit of water colors

at the Walter Kimball Studio on Park Street in February. Among the paintings were many scenes from around the shores of Cape Ann, where Mr. and Mrs. Spaulding spent a portion of last summer. On March 14 he became the proud father of a young daughter.— G. N. Calkins, assisted by W. E. Kellicott, has given a series of seven lectures at Columbia University on the Protozoa, the simplest forms of living animals. The lectures were novel, inasmuch as they were illustrated by the living organisms projected through a miscroscope upon a screen where the images were magnified 7,200 diameters. This method of illustration has never been used before on such a scale. — Frank L. Chase is an engineer at the Grand Central Depot, New York.— At the monthly meeting of the New England Railroad Club, March 13, P. M. Hammett, assistant superintendent of motive power of the Boston & Maine Railroad Company, was elected treasurer.

1891.

CHARLES GARRISON, *Sec.*
Lexington, Mass.

Roger W. Conant has recently left the Boston Elevated Railway, and accepted the position of New York manager for the Gold Car Heating Company. — Lewis A. Dunham, mining engineer, has had a wide range of travel and experience since graduating, having been in various positions in the United States, Mexico, Central America, and British Columbia. He is at present at Kansas City, which is his permanent address, although he has no "home."— George A. Campbell has also had his share of travel and study, having been at Harvard 1891–93; Göttingen, Germany, 1893–94; Vienna, Austria, 1894–95; Paris, France, 1895–96. In 1897 he settled in Boston as an electrical engineer, where he is to be found at the present time. — Howard C. Forbes announces the birth of a son, Howard M., February last.— Jeremiah Campbell announces the birth of a daughter, Barbara, March 1, 1901.— George K. Hooper has returned from the West, and has just started as a consulting engineer at 31 Milk Street, Boston.— Ernest A. Hersam, assistant professor of metallurgy, University of California, Berkeley, Cal., writes that he is warmly

interested in the good old class of '91.— The secretary would like to have all members of the class, or those connected with it at any time, fill out the blanks which have been sent out, and return them at once. In case none has been received, please notify the secretary.

1892.

PROF. SEVERANCE BURRAGE, *Sec.*
Purdue University, Lafayette, Ind.

There was quite a reunion of '92 men at the annual alumni meeting and banquet at the Brunswick Hotel in Boston, December 29, the following being present: Bigelow, Fitz, E. R. French, Fuller, Ingraham, Johnston, Metcalf, Moody, Perkins, Pope, Rhodes, Skinner, Wales, and Wendell.— A recent item in one of our Boston papers described a new dormitory,— Elizabeth S. Mead Hall,— now under construction for Mount Holyoke College, the plans for which were drawn by Messrs. Rand and Skinner, architects of Boston.— John G. Morse, of Salem, is reported as being in the engineering and inspection department of the Boston Manufacturers' Mutual Fire Insurance Company.— Herbert R. Moody is still pursuing graduate studies at Columbia University.— 92's Walker Memorial subscription has passed the $1,500 mark, and numerous additions to the fund are looked for in the next five months. The general committee means to close up the matter by July 1, 1901, and expects to be able to report then the subscription of the entire sum of $100,000. Already the fund exceeds $60,000. Land for the building has been set aside, and funds for maintenance promised by the Corporation. Even the "doubting Thomases" recognize the success of the project as assured, and are helping to swell the receipts. Do not miss the opportunity to add your mite.—We note with pleasure the recent promotion, to the dignity of assistant professorship, of the members of the class of '92, formerly instructors at the Institute, and extend our hearty congratulations to the successful candidates. It is particularly gratifying to know that all of the '92 men — five in number — were thus honored: Derr, Fuller, Johnston, Park, and Wendell. That this honor is not won without long, hard, and conscientious preparation on the part

of the candidates, is evidenced by the following sketches of the professional work of the above men during the past nine years since graduation.— Louis Derr, assistant professor of physics, who, it will be remembered, was a graduate of Amherst College, B.A. 1889, before his entrance to the Institute, took his master's degree at Amherst in conjunction with his bachelor's degree at the Institute in 1892. He was assistant in the Department of Physics from 1892 to 1893, and instructor from 1893 to 1901, conducting courses in physical laboratory with Professor Goodwin, and lecturing upon calculating machines, photography, and dynamo machine design. In this connection he has published valuable notes on dynamo design, and on the methods of telegraphy, and contributed numerous papers to various technical journals. Since 1894 he has had charge of the instruction in physics given to the students of the Boston Normal School of Gymnastics, and from 1895 has also been instructor in physics at the Boston University.— Charles E. Fuller, assistant professor in mechanical engineering, was assistant for two years in mechanical engineering drawing. In 1894 he was made instructor in mechanical engineering, since which time he has had charge of the applied mechanics laboratory work, in testing the strength of materials, giving courses also in applied mechanics. He has devoted considerable time outside of his work to the testing of building materials, steel, iron, and timber, as well as of stone, rope, and fabrics. In his summer work he has been connected with various engineering companies, amongst them the Johnson Street Railway Company. While in the employ of the latter, he made most of their assembly drawings for the New York Third Avenue cable road.— William A. Johnston, assistant professor of mechanical engineering, was assistant in the steam engineering laboratory for the first year and in the applied mechanics laboratory during the second year after graduation. In 1894 he became instructor in mechanical engineering, which position he has since held, giving, in addition to his mechanical engineering and steam engineering laboratory work, courses in mechanism, gearing, and ma-

chine tools, and in applied mechanics. He has also done considerable work in the inspection and testing of building materials, and has spent most of his summers in work relating to the office of the Middlesex County engineer, involving surveying, road construction, the inspection of materials and structures, bridges and culverts.— Charles F. Park, assistant professor in mechanical engineering, was assistant to Professor Lanza for two years, devoting himself largely to work incident to the locomotive option. In 1894 he became instructor in the Department of Mechanical Engineering, and for two years thereafter was in the steam engineering laboratory. Since 1896 he has had charge of the second and third year mechanical engineering drawing, giving courses in mechanism, gearing, and machine tools, and in heat and ventilation. Professor Park designed the apparatus for testing injectors, which was described in the *Technology Quarterly*, and has since been translated into French, and has done outside testing work upon the strength of building materials, shafting, and fabrics, as well as upon the efficiency of engines and power plants. He has conducted summer school courses in mechanism and engineering drawing, and has also given courses in machine drawing and mechanism at the Wells Memorial Institute in Boston.— George V. Wendell, assistant professor in physics, was assistant in that department from 1892 to 1893, and instructor from 1893 to 1896. In the summer of 1896 he went abroad on leave of absence, under the Savage Scholarship, and studied for two years at Leipzig under Dr. Geheimrath Wiedemann. He there presented his thesis on "Optical Rotation of Tartaric Acid and Turpentine," and took his doctor's degree, Ph.D., July 4, 1898. He then went to the University of Berlin as Honorary Fellow from the M. I. T., and devoted himself to studies on the "Conductivity of Heat in Rarified Gases," under Professor Warburg of the department of physics. In 1899, on his return to the Institute, he resumed his work as instructor in the Department of Physics, and lectured on the applications of polarized light in physics and chemistry. As secretary of the Society of

Arts, Dr. Wendell is largely responsible for the lectures and papers given under the auspices of that society. It is perhaps worthy of note that the class of '92 thus has a larger representation upon the Faculty of the Institute than any other class.

1893.

FREDERIC H. FAY, *Sec.*
60 City Hall, Boston.

Once more we have to make the sad announcement of the death of two of our members, John Clifford Brown and John Gould Anthony, both of whom died in January last. Jack Brown had been in military service since the outbreak of the Spanish War; and at the time of his death, which occurred at San Francisco, he was with the United States Engineers, and was coming home on sick leave. His death was undoubtedly hastened by the death, shortly before, of his mother, who had gone to San Francisco to nurse him in his illness. Anthony's death was caused by typhoid fever, and occurred at Silverton, Col., where he was engaged in his profession of mining engineering. Extended notices of both of these men will appear in a later number of the REVIEW. — The second informal class meeting of the past winter was held at the Technology Club on Saturday evening, the 2d of February. The attendance (twenty-one) was the largest of any of the informal meetings. Dinner was served as usual at half-past six, giving the members an opportunity for an hour or two of social intercourse. Upon adjourning to the "common room," the company was entertained by two most interesting smoke-talks, the first, by F. W. Hadley, being upon "The Power Plant of the South Terminal Station, Boston." As superintendent of the plant, Hadley was in charge of the manufacture of all steam, electricity, and compressed air used about the terminal, and of the artificial ice and Pintsch gas for the station and cars. In addition, he had charge of the heating, ventilation, and refrigeration of the building, which is the largest railway station in the world. It is interesting to note that the electrical equipment of the station was installed by the Lord Electric Company, of which F. W. Lord, '93, is president. Hadley's talk was illustrated by

lantern views. The second talk of the evening was by G. T. Blood, who in a clear and interesting way described the mysteries of "Long Distance Telephony," and spoke at length of the new common battery system which is rapidly being installed at the large, up-to-date telephone exchanges. The following members were present: Blood, Codman, Crosby, Dawes, Densmore, Farwell, Fay, Hadley, H. A. Houghton, Johnson, Keith, H. A. Morss, E. S. Page, W. B. Page, Reynolds, C. W. Sawyer, Shurtleff, Soley, Spofford, Sweet, Waldron.— Frederic A. Wallace has been for some time master mechanic of the Pacific Mills, Lawrence, Mass.— Frederic W. Baker, late assistant engineer, United States Navy, is now with the New York Ship-building Company, Camden, N.J., as naval architect. Arthur C. Lotz, of 163 Randolph Street, Chicago, has been making many tests and experiments on acetylene gas generators, and is now erecting engineer for the Abner Acetylene Gas Company of Chicago. At present, Lotz is building what is undoubtedly the largest automatic acetylene gas generator in the world. It will have a rated capacity of 28,000 candle-power, and will be tested to 42,000 candle-power. — Herbert A. Houghton and Miss Sarah Storrow Gannett were married June 27, 1900. After assisting William Stanley to perfect "the Stanley Watt Meter" and designing special tools for the same, Houghton took a position, about two years ago, with the Crompton & Knowles Loom Works (Grand and Taintor Streets), Worcester, Mass., as designer of textile machinery.— Frank S. Badger, assistant engineer with the Continental Filter Company, 35 Wall Street, New York City, has recently been in charge of the design, erection, and operation of a three-million-gallon water filtration plant at Middletown, N.Y., in which are used both gravity and pressure filters.— Charles Henry Hoyt, who was connected with the class for about two years, is now with the Consolidated & McKay Lasting Machine Company of Beverly, Mass. Hoyt was married on November 26, 1900, to Miss Lizzie Blaser, of Salem, Mass. They will reside in Beverly.— George S. Barrows, engineer of the Wels-

bach Light Company, Gloucester, N.J., has recently delivered addresses on "The Welsbach Light" before the Franklin Institute and the Committee of Arts and Sciences of that body at Philadelphia.— S. H. Brockunier has recently returned from Honduras, where he has been working a gold placer deposit. He will go back to Honduras again, but says he does not like the climate.—The firm of Smith & Biscoe, architects, the junior partner being Maurice Bigelow Biscoe, has recently been changed to Warren, Smith & Biscoe, with a new office at 110 Boylston Street, Boston. The other members of the firm are H. Langford Warren,'79, and F. Patterson Smith, '91.—J. E. Woodbridge has severed his connection with the *American Electrician*, of which he was editor, to take a position in the railway engineering department of the General Electric Company at Schenectady, N.Y. — Kilburn Smith Sweet, instructor in civil engineering at the Institute, and Miss Jessie Louise Johnson, of Boston, were married September 19, 1900. Their home is 33 Coolidge Street, Allston, Mass. — When last heard from, in December, Arthur E. Fowle was superintendent of the glycerine and soap factories of the Compania Industrial Jabonera de la Laguna, his address being Gomez Palacio, Durango, Mex. — Charles E. Buchholz, lately supervisor of bridges and buildings on the Eastern Division of the New York Central & Hudson River Railroad, is now acting division engineer on that road, his address being Weehawken, N.J. — S. Stevens Haskell, after taking a course in architecture at l'École des Beaux-Arts, Paris, has returned to this country, and is now architect in charge for Cass Gilbert, architect, 111 Fifth Avenue, New York City.—Jacob Winn Brown, of Woburn, Mass., married Miss Edith E. Ramsdell in June, 1900. Brown is connected with the publishing house of Silver, Burdett & Co., 221 Columbus Avenue, Boston. — Clarence Dyer Gilchrist, of Evansville, Ind., has held a position with the United States Commission to the Paris Exposition, and in November last his address was 20 Avenue Rapp, Paris, France.— Frank B. Holmes was married April 26, 1899. He is now salesman and secretary of the D. W.

Field Company, Brockton, Mass., his office address being 121 Summer Street, Boston.— William T. Barnes is at Shops Relay, Washington, Ind., as resident engineer on the reconstruction of the Mississippi Division of the Baltimore & Ohio South-western Railroad.—James P. Buckley, president of the Crescent Brass and Iron Company of Detroit, Mich., was married October 18, 1900, to Miss Lillian R. Bogart.—Arthur A. Shurtleff, landscape architect with Olmsted Brothers, Brookline, Mass., is also assistant in landscape design at Harvard University.— Frederick T. Towne is general superintendent of the Yale & Towne Manufacturing Company, Stamford, Conn.— William H. Cadwell has been appointed agent of the Jackson Company, in charge of the Jackson Mill, Nashua, N.H.— Frederic Bassett Abbott and Miss Alice Goodsell Dunn, both of Lynn, were married September 12, 1900, and reside at 51 Baltimore Street, Lynn, Mass.— John Ormsbee Ames, of Providence, R.I., and Miss Madeline L. Abbott were married November 27, 1900.— George E. Barstow is designer for the Thomson Electric Welding Company, 163 Pleasant Street, Lynn, Mass.— John Sturgis Codman is selling agent for New England of the General Incandescent Arc Light Company of New York.— Dalton Parmly is chemist for the Wellston Iron and Steel Company, Wellston, Ohio.— James A. Emery is engineer in charge of construction for the Atlanta Rapid Transit Company, his address being 325 Prudential Building, Atlanta, Ga.— Arthur Morton Burtt is architectural draughtsman in the civil engineers' department, Charlestown Navy Yard, Charlestown, Mass. — Charles Custer Brown is chief draughtsman of the Standard Steel Works, Burnham, Pa.

1894.

S. C. Prescott, *Sec.*

Mass. Inst. Technology, Boston.

H. O. Lacount is electrical inspector, Factory Mutual Insurance Company, 31 Milk Street. — C. H. Johnson is engineer for the Old Colony Sand and Stone Company.— L. W. Pulsifer is holder of the much-coveted Rotch Travelling Fellowship in architecture, and gives 59 Rue de Provence, Paris, as his present address (care Perier, Mercet

& Cie.).— R. W. Proctor is superintendent of the W. S. Merrell Chemical Company, Cincinnati, Ohio.— The number of manufacturing chemists in America who export to Germany is very small, indeed; but A. A. Claflin, superintendent of the Avery Chemical Company of Littleton, Mass., has scored a great success in finding a German market for some of his products. — N. B. Day is a student at the Harvard University Law School. — W. H. Sayward, Jr., is a physician at 26 Bird Street, Dorchester.— T. H. Torossian is now located at Cazvin, Persia, where he is a contractor on the road, Enzele-Teheran.—Mason S. Chace is outside superintendent of the Crescent Ship-yard, Elizabethport, N.J.— A. A. Clement is assistant superintendent of the N. K. Fairbanks Company, 227 Dearborn Street, Chicago, Ill.— Marion L. Mahony, 281 West Adams Street, Chicago, Ill., is a student at the Art Institute.— A. A. Shurtleff is with Olmsted Brothers, also assistant in landscape architecture at Harvard University.— F. P. Simonds is of the firm of Stratton & Simonds, architects, 52 Kilby Street, Boston, Mass. — Austin Sperry is with the Fulton Engineering and Shipbuilding Works, 2100 Pacific Avenue, San Francisco, Cal.— The annual meeting and dinner of '94 was held on Saturday evening, February 23, at Young's Hotel. The following men were present: Batson, Claflin, Duckworth, Gardner, Hawes, Hunt, Janvrin, King, Lane, Prescott, Reed, Sherman, and Wrightington. Notwithstanding the small attendance, the reunion was very much enjoyed by those present. The election of officers for the ensuing year resulted in the choice of S. G. Reed, president; J. W. Phelan, vice-president; G. B. Haven and L. P. Lane, Executive Committee. After the dinner, King presided as toastmaster most acceptably. Reed responded for the class of '94. Hunt gave a most interesting and able address on the Institute training as preparatory for the law, and incidentally described the difficulties he had to surmount in regard to taking his bar examinations in New York, as the degree of the Institute was not recognized by the bar examining board as the equivalent of a college A.B. degree. As a result, he was obliged to

give three years to study of law, although it was conceded by the examining board that he was entirely competent to take the examinations at the end of two years. As this is a very important matter to Institute men who wish to go into the law, Hunt exerted himself to bring about a change of conditions; and it is probable that in the future the Institute degree will receive its due consideration. Howes described the work of the electrical inspector, and gave an account of some of the different types of electric cars used in the trials on the Boston Elevated Railway. Lane responded to Statistics, giving a speech sparkling with humor. Prescott told a few incidents of his summer abroad, and read some verses especially dedicated to the Institute. A most pleasing event of the evening was the receipt of a telegram from President Pritchett, who was in Washington, extending his good wishes to the class. It was a source of regret to all that he could not be present to meet the '94 men personally.— A. R. Mackay has been elected treasurer of the Horseshoe Mining and Milling Company, thus changing his address from Deadwood, So. Dak., to Montreal, Canada.— Robert Loring, who has been for some years a salesman for Hoe & Co., printing presses, has been transferred to New York, and is now in charge of the office in that city.— S. G. Cousins is mining in Butte, Mont.— R. H. Flint is manager of a mine at Angel's, Calaveras County, Cal.— After a year abroad, Mr. and Mrs. D. deLancey have settled in Boston.— Theodore Horton has been elected an associate member of the American Society of Civil Engineers.— The following was clipped from the New York *Herald* of Saturday, March 9: "The engagement is announced of Miss Margaretta Wiling Hutchinson to Mr. John Conyngham Stevens, both of Philadelphia. The prospective bride is related to the Willings, Pembertons, Emlens, and Markoes. Mr. Stevens is a son of the late Bishop Stevens, and lives with his mother, Mrs. William Bacon Stephens. He is a graduate of the Boston Institute of Technology, and belongs to the Rittenhouse Club and City Troop." — William H. King spent a portion of the summer abroad, visiting Lon-

don, Paris and the Exposition, Cologne and the Rhine.— C. G. Abbot left Washington about February 10 for San Francisco, whence he sailed on a government transport for the East Indies. He goes with the party from the Naval Observatory to make observations on the total eclipse of the sun, May 19. The party will be stationed near Padang, Sumatra, probably not far from the Institute party.— M. F. Jones is fire insurance inspector, New England Bureau of United Inspection, 71 Kilby Street, Boston.— S. C. Prescott addressed the Atlantic States Packers' Association at its convention in Rochester in February on the "Cause and Prevention of Sour Peas," and on March 6 read a paper before the Boston Society of Natural History on "The Applications of Bacteriology to Certain Arts and Industries."— J. C. Locke, formerly civil engineer in the department of docks, United States Navy, has been transferred to the army; and his headquarters are now Fort Hamilton, N. Y.— F. L. Stearns occupies a responsible position in the street department, city of New York.— C. W. Bowles is surveying at Waldo, Ore.— G. W. Sherman has increased his lines of specialization by adding facilities for all kinds of blue-print work, and already has a large mail and express business in this particular branch.— C. N. Wrightington has been promoted from the purely engineering position he held with the Ludlow Manufacturing Company, and is now in charge of a new mill belonging to the company. This new mill has been constructed under Wrightington's superintendence, and is so well provided with improvements and conveniences that it is practically a model establishment of its kind.

1896.

F. E. Guptill, *Sec.*

1006 E. Main St., Richmond, Va.

Thomas K. Brackett, formerly of the class of '96, died about the 1st of March in Portsmouth, N.H., where, with his family, he had been temporarily located.— Charles G. Hyde is assistant engineer of the Spring Garden Water Company, Philadelphia, Penn.— William H. McAlpine, Course XI., formerly located with the Metropolitan Water Board, Boston, is now on

the United States steamship "Ranger," and at present is engaged in constructing a coaling station on the Pacific Coast. — R. E. Bakenhus, formerly assistant in civil engineering at the Institute, has recently been appointed civil engineer in the United States Navy.

"IN MEMORIAM.

"The death of Francis Polk Blake is an instance of the sacrifice too often entailed where the reality of the obligations in life are most intensely felt. This talented young man was descended in several lines from those whose distinction is historical on both sides of the Atlantic. Of the same family as the illustrious admiral of Cromwell's time, his Blake ancestors were prominent in North and South Carolina for several generations. Through their marriages, he was descended from the Rutledges and Arthur Middleton, the signer of the Declaration of Independence. His grandfather on his mother's side presents a remarkable instance of devotion to duty — as he saw it. A student of West Point of distinction, like many others educated at that famous nursery of the best type of our countrymen, Leonidas Polk found that his true field was in the Church rather than in the army. He rose to the highest rank in the Church, becoming the bishop of his State. When the citizens of that State, believing the compact of the Constitution broken when their common rights in the Territories were denied, decided to withdraw from the Union, and war entered its borders, Bishop Polk felt that his people were entitled to his military knowledge; and, as lieutenant-general in the Confederate army, he proved his ability in the field of war. His son to-day holds the first rank in medicine in New York. With such blood, can it be wondered at that young Blake felt it his duty to maintain so high a heritage? Compelled, as all Southerners of the first rank have been since the war, to struggle with life from the lowest rung of the ladder, he gave his best energies of mind and body to his work. Of unusual ability, he secured a thorough education, finishing at the Boston School of Technology with very high testimonials. His early work in his profession, unfortunately,

was in an unhealthy part of Alabama, where for five years he pursued his vocation, until the malarious influences fatally undermined his health. He received an offer last summer to come to Pennsylvania, and in the high mountain air he hoped to find his strength return. He was urged to take a longer rest before assuming so serious a responsibility as the post of superintendent of a coal company's works entailed. His high courage and spirit made him hopeful, and he entered far too soon upon the work. In the short time he filled the post he proved how worthy he was of the confidence reposed in him, but his conscientious devotion to the interests of those whom he served was too great. He has fallen under the strain, struggling to the last to maintain the honor and name of those from whom he sprang. *Requiescat in pace.*" —*Daily Evening Telegraph, Philadelphia, Pa., Dec.* 24, 1900.

1897.

JOHN A. COLLINS, JR., *Sec.*
55 Jackson Street, Lawrence, Mass.

Thomas C. Atwood was married on Tuesday, January 1, to Miss Grace Mabel Winslow, of Malden.— Proctor L. Dougherty has been elected vice-president of the Washington M. I. T. Society for 1901.— F. L. Edmands is pursuing a course in patent law at Columbia University. Mr. Edmands is an expert examiner in the Patent Office. — Frederic N. LeBaron, formerly with the American Luxfer Prism Company of New York, has entered into partnership with H. G. Jones. They are the general agents for the Solar Prism Company of Cleveland, Ohio.— Harrison W. Smith, of the Physics Department, left on February 21 with Professor Burton on the trip to Sumatra to observe the solar eclipse of May. Just before leaving, he wrote the following note to the secretary of '97: "Enclosed I hand you $2.00, which, I trust, will cover my dues to date for class of '97. I think it advisable to attend to this now, for I may appear as an irresistibly attractive morsel to the cannibals of Sumatra." Apparently, Mr. Smith thinks his own total eclipse may occur along with that of the sun.— It was gratifying to see the number of '97 men present at the alumni dinner at the Brunswick December 29,

1900. About a dozen were there, and each man felt fully repaid for coming. As Dr. Pritchett rose for the first time before the general alumni, an outburst of welcome and enthusiasm arose as only such a gathering can give; and the alumni dinner of 1900 will be long remembered for the brilliant men who were the guests of the evening, and for their equally brilliant speeches. — The firm of Bradlee & Chatham, of which Charles W. Bradlee is a member, announce the removal of the firm to No. 85 Union Street, they having been appointed special agents for the sale and installation of Magee Steam and Hot Water Apparatus. — It is the intention, no doubt, of the Institute to have a fitting exhibit at the coming Pan-American Exposition at Buffalo. In connection with this there is an excellent opportunity to obtain data regarding the active part that Institute men take in the Exhibition. I think it is not too much to say that there is scarcely an engineering or other industrial company of any note in the United States that has not on its rolls the name of at least one Institute man. Further than this, in many instances, these names are those of the managers of the companies with which they are connected. Would it not be well, therefore, to establish an Institute headquarters, where all Tech men visiting Buffalo could register, and in addition have some person in charge whose duty it would be to collect all statistics relative to the participation of Institute men in the development and operation of the Exposition? Then, as an afterthought, these headquarters might be made the scene of many a social event, reunion of classes, courses, etc. But this is a secondary issue. Any such data as is mentioned might be of much value later in proving that the Institute was a powerful factor in the Applied Science development in this country, and as such was deserving of both State and national aid.

1898.

C.-E. A. Winslow, *Sec.*

Hotel Oxford, Boston.

Elliott Rensselaer Barker is now with the Burgess Sulphite Fibre Company of Berlin, N.H. Last year he was engaged in special work for the Massachusetts State Dairy Bureau, detecting oleomargarine sold in

the central part of this State.— John S. Small's second son was born in July of this year. Quite a small family.— F. L. Bishop is head of the Department of Physics at the Bradley Institute, Peoria, Ill. Mr. Bishop was married in August, 1898, to Miss Lelia A. Prior.— G. H. Wright, after leaving Technology, spent three years in European travel, making also one visit to Algiers, where he had an interesting experience with Dreyfusard rioters, of which he spoke before the Technology Club December 18. Last March, while living in Hudson, Mass., Wright, at the risk of his own life, saved from drowning two boys who had fallen through the ice of the Assabet River, and received the first medal of the Humane Society for his gallant work. He is now a student at the Harvard Dental School.— P. H. Lombard wrote to the secretary, December 1, as follows: "I am very sorry to write I shall be unable to attend the third annual dinner of the class of '98 on Saturday evening. Our Testing Department is to hold a dinner in Albany on the same night; and being, like yourself, one of a committee of arrangements, I must be present to set the ball a-rolling. You may be interested to know that the dinner I speak of is the first ever held by the so-called students of the General Electric Company's Testing Department; that the head of the department is a Technology man, E. B. Raymond, class of '90; that there are over thirty representatives of our grand institution of learning here in the company; and that three members of the class of '98 will be present at this dinner."— F. B. Heathman is receiving congratulations on the birth of a son (Tech. 1918, according to the happy father) on November 30.— The following clipping from the daily paper attracted the eye of many '98 men: "Miss Mabel C. Proctor, daughter of Mayor and Mrs. George O. Proctor, of Somerville, and Mr. Charles H. Pease, of Marlboro, N.H., were married in the First Congregational Unitarian Church, Highland Avenue, Somerville, on October 31. Mr. George R. Wadsworth, of Albany, N.Y., was best man. There were about six hundred guests present. Upon returning from a short

wedding trip, they will be 'at home' at 149 Lowell Street, Somerville."— Three '98 men were acting last fall as assistant engineers on as many divisions of the N. Y. C. & H. R. R.R.,—G. R. Wadsworth has recently been promoted, and transferred from Albany to New York City. He is Junior of the American Society of Civil Engineers, R. T. Horton at Watertown, N.Y., and L. H. Byam at Jersey Shore, Pa.— W. E. Kimball is draughtsman in the office of superintending naval constructor, Fore River Engineering Company.— William G. Smith is engineering inspector of the Wachusett Basin. His address is 56 Cedar Street, Clinton.— The Class Directory is now in course of preparation, and will probably be distributed some time in April.— An informal reunion of '98 men near Boston was held at the Technology Club, Tuesday evening, March 5. Between thirty-five and forty men were present to enjoy the playing of Learned and Pease, Bleecker's singing of "Maggie Dooley," Putnam's performance of a *pas seul*, and Coburn's oratory.— J. L. Mara is in the hotel business in Buffalo; but his present address is 279 Congress Street, Boston.— L. D. Gardner is with the *Mail and Express* of New York, looking after the financial business.— R. S. De Golyer is in Chicago with the Architectural Department of the Board of Education. — E. W. Norton's address is 7 Oberlin Street, Worcester, Mass. He is chief draughtsman for the Flexible Door and Shutter Company of Worcester, and is also connected with the Manhattan Construction Company of New York City.— G. W. Hill is at Glendale, Hamilton County, Ohio. He reports himself as a "shop systemizer." — T. E. Tallmadge writes from Chicago: "The North-western Association, which meets every month at the 'Bismarck,' is a great institution,— the very strongest, I'm sure, in the country. Our annual dinner out-classes Harvard's or Yale's affairs; and we always have a big turnout, from twenty to forty every month and a hundred or so at the annual. You would see a lot of old faces at one of our dinners. Zimm with his stein of beer, Jack Pechin, Pen Dell, Sargent, Herbert Lord, Milton Hall, etc." — F. H.

Twombly has recently perfected a cable code which Flint, Eddy & Co. are using and for which he has recently received a copyright. He claims to have two million words as against two hundred and fifty thousand in earlier codes.— C. F. Wing is engaged to Miss Cornell, of New Bedford.— L. C. Palmer is acting as superintendent for F. W. Burt, box manufacturer, Buffalo, N.Y. His address is 72 Hampshire Street.— J. S. Bleecker is now in the office of Stone & Webster at 93 Federal Street, Boston.— R. S. Willis is manager and part owner of a large rubber plantation at Orizaba, near Vera Cruz, in Southern Mexico. He has contracted a touch of the malaria, prevalent in this coast region, but is doing well financially, and is receiving congratulations on his engagement to Miss Hitchcock, of Phœnix, Ariz.— R. S. Allyn is practising patent law in New York City.— S. Fleisher was married to Miss Lillie E. London, of 6 Cornel Street, Roxbury, on Friday, the 22d of February.— A paper on two cases of Filariasis received at the Boston City Hospital, published in the *American Journal of the Medical Sciences* for November, 1900, is illustrated with some excellent micro-photographs by F. L. Richardson.— F. N. Curtis is junior counsel with C. F. Perkins at 82 Devonshire Street, Boston.— J. M. Morris is in the superintendent's office of the Fire Alarm Branch of the Boston Fire Department.— R. R. Bryan is practising as a mechanical and electrical engineer at the Presidential Building, Atlanta, Ga. He also represents the Phœnix Iron Works Company of Meadville, Pa., the C. & C. Electric Company of New York, and the Geary Water-tube Boiler Co. of Oil City.— B. A. Adams is teaching manual training in the Mechanic Arts High School, Springfield, Mass.— G. H. Boeck is in the real estate business in St. Louis.— W. T. Camp is an assistant paymaster in the United States Navy.— L. S. Streng and H. K. Conklin are room-mates in the Lawyer's Building, Newark, N.J. Conklin is associated with Boring & Tilton, architects, of New York City.— N. C. Walpole is superintendent of the machine shop of the Builders' Iron Foundry of Providence, R.I.— T. J. Driscoll is the resident engineer of

the United Coke and Gas Co. at Sydney, N.S.— R. B. Van Horn is at Santiago, Cuba, acting as assistant manager of construction of the Eastern Division of the Cuba Railroad.— G. B. Southworth is at 10 Park Square, Boston, in business as a pharmaceutical chemist.— L. D. Higgins is teaching science at the Morgan School, Clinton, Conn. — F. M. Robertson, of Trapelo Road, Waverley, will take his M.D. at the Harvard Medical School this spring.—A. O. Portner is practising law in Washington. '98 men will remember him as an expert on illegal arrests.— A. H. Hitchcock is in the employ of Phelps, Dodge & Co., at the concentrating mill and smelter operated by that company at Nacozari, Sonora, Mex. His address is via Bisbee, Ariz. — C. S. Murlless is practising dentistry at Holyoke, Mass.— J. H. House, Jr., is studying at the École des Beaux-Arts; and his address is Rue Bonaparte, corner Rue Honoré Chevalier, Paris, France.—P. C. Mills is with the Atlantic City Coaster Company as mechanical engineer.— S. A. Hooker is assistant superintendent of Reliance Textile and Dye Works of Covington, Ky.— '98 men will read with sorrow the following extract from an Omaha paper of October 7, 1900: "Ernest Schroeder, the young man who died at St. Joseph's Hospital Thursday last, was the only son of Louis Schroeder, one of Omaha's oldest citizens. He was born October 1, 1873, in Omaha, and was twenty-seven years old when he died. He graduated from the Massachusetts Institute of Technology with high honors, and was the leading man in the office of John Latenser, the architect of this city. Mr. Latenser speaks very highly of the young man, and says that he was considered one of the best architects and draughtsmen in his line in the city. Mr. Schroeder drew the plans for different schools in this city, among them the Cass School, Pacific School, and Saunders School, also the high school at Blair and the school at Calhoun, and finally designed the elevation for the new Omaha High School."— News of the death of James Saxton Barber, of Canton, Ohio, in Hong Kong, China, on November 15, has been received in Washington. At the time of his death, Mr. Barber was serving as assistant

paymaster on board the United States steamship "Don Juan de Austria," which was stationed at Hong Kong. Information that he had been ill with typhoid was received by his friends in this country; but, until the arrival of the sad news of his death, it was hoped that he had passed the critical stage. James Saxton Barber was born in the old Saxton homestead in Canton in July, 1874, and was the oldest child of Mr. and Mrs. M. C. Barber. He graduated from the Canton High School, and then attended Chester Military Academy at Chester, Pa. From there he went to the Williston Seminary at Easthampton, Mass., and prepared for his entrance to Technology. At the Institute he will be remembered by many who are now graduates as the leader of the Mandolin Club and as the plucky little baseball captain of the '98 class team. He was a member of the Technology Chapter of the Chi Phi Fraternity, and among his fellows he was extremely popular. Under the last Cleveland administration he was appointed to a position on the Geodetic Survey, and was sent to Indian Territory, after which he spent a year or more in the Klondike region. On his return he passed the civil service examinations with high grade, and was appointed to service on United States cruiser "Michigan" on Lake Erie. Desiring more active duty, he was assigned to the "Don Juan," and, at the breaking out of the trouble with China, was sent to Hong Kong. He leaves a widow, *née* Miss Whitely, of San Francisco, to whom he was married in August of this year. The tidings of the death of this brilliant young man, with such high attainments and such a promising future before him in his chosen work, will be received with great sadness by his many friends. G. F. U.

Resolutions.

Whereas death has removed from our midst our classmate and companion, James Saxton Barber; and whereas, by his decease, his friends, his Alma Mater, and the community have been deprived of one who had gained the respect and affection of all,—be it

Resolved, That we, the class of 1898, Massachusetts Institute of Technology, testify to the sense of great loss we experience in his death, and to the sympathy we feel toward his relations; and be it further

Resolved, That a copy of these resolutions be placed in the records of the

class. Charles F. Wing, Jr., Abram French, Paul Bancroft Wesson. For the class.

1899.

WALTER O. ADAMS, *Sec.*

1776 Mass. Ave., North Cambridge.

The annual meeting and dinner of the class was held at the Technology Club on Saturday evening, December 22, 1900. Twenty-seven men were present, and the dinner proved to be one of the most enjoyable we have had. Directly after dinner the annual business meeting was held. The most important action taken was the indorsing of the proposed amendment to the constitution which would replace the irregular assessment by yearly dues of $1.00. This amendment has since been submitted to the class for postal ballot, and has been accepted. It was also voted to designate the first male child born to a graduating member of '99 as the class boy, and to present him with a suitable gift from the class. This follows a custom adopted by some of the older classes. A committee was appointed to consider the advisability of obtaining space for a class memorial tablet, to be placed in the Walker Memorial Gymnasium. Subscription blanks for the Memorial Fund were distributed, and about $300 subscribed at the dinner. The remainder of the evening after the business meeting was passed pleasantly with music and informal speaking. Dudley Pray told very interestingly of a rough canoe trip through dangerous rapids; Burt Richards spoke of work in the laboratory of the Boston Board of Health; Clifford Swan and George Perkins officiated at the box; Adams sang. That finished the evening, and we broke up with the usual class and Tech cheers.— The secretary takes much pleasure in announcing the birth of the first child of a graduating member. On March 6 a "seven-pound girl" was born to H. P. James. '99 sends congratulations, James, and to the little one our best wishes.— The election of Ben Morse to be vice-secretary, replacing Miles Sherrill, lately resigned, is announced.— Clarence Renshaw on December 19 married Maidee Bennett Milnor at Montclair, N.J. They will live at 804 Wood Street, Wilkinsburg, Pa.— Henry H. Hew-

itt, Course IV., returned from Paris where he is studying at l'École des Beaux-Arts. After a short stay in Boston he went to Chicago, and will leave for Paris again in April.— Earle Phelps, Course V., is in Ludlow Centre, Mass., investigating the Springfield water supply for the State Board of Health.— Ed. Bergstrom, Course IV., is now with the Falls Manufacturing Company, Oconto Falls, Wis., at their paper mills.— At date our contribution to the Walker Memorial Fund amounts to $2,024. Every day more men are waking up to the fact that the time to contribute has come. Let every one feel that he is counted on to let the committee know his decision, and know it now.— The monthly reunions are very poorly attended. Why these pleasant meetings are slighted is somewhat inexplicable. They will be continued through the spring, however; and their continuation next fall will depend on the interest shown in the few remaining meetings.— Dean Hinman has accepted the position of draughtsman with the Colorado Fuel Company, Pueblo, Col.— A. S. Grosvenor has resigned his position in the office of the supervising architect, treasury department, to accept a position with the Pennsylvania Railroad as a civil engineer in the office at Pittsburg, Pa. At the time of his resignation he had charge of the heating and plumbing systems to be installed in the extensions to the Bureau of Engraving and Printing.

1900.

GEORGE E. RUSSELL, *Sec.*,
Mass. Inst. of Technology, Boston.

The secretary was recently favored by a call from George H. Archibald. Some time after leaving Tech., Archibald was connected with the Dominion Steel Company, at Sydney, N.S. For the past few months he has been with the United Coke and Gas Company, and has been their engineering assistant while constructing a new plant at the above-named place. Recently the company has decided to enlarge its scope, and Archibald goes to New York City to assist in the erection of an immense plant. Letters may be sent in care of United Coke and Gas Company, New York City.— At the time of writing, preparations are under way for the

first annual class dinner. By the time this number is issued, its glory will have become a matter of history and memory.— Richard Wastcoat, after several months of business, has taken employment as estimator with the Boston Bridge Company, and may be found at the company's office.—Russell Suter has severed his relations with the city engineer of Cambridge to engage in government work.— Zenas M. Briggs, Yale '98, and a member of M. I. T. '00, is employed in the Pittsburg office of the Pennsylvania Railroad Company. The secretary has just heard that he has become a Benedict. We congratulate him.— Herbert R. Stearns is about to conduct an investigation on the action of high explosives on rock. He will pay especial attention to the most economic arrangement of drill-holes, their reference to the bed of the rock, and also the amount of stone obtained per pound of explosive. Dynamite and nitro-glycerine will be used in the experiment. It will be remembered that he is in the employ of the Metropolitan Sewerage Commission. — Harry L. Grant is back at the Institute, completing his studies. During the late months of the winter of 1899 he was obliged to give up his course, and go South in search of health and strength.

REVIEWS

COMMERCIAL ORGANIC ANALYSIS

By Alfred H. Allen, F.I.C., F.C.S., Public Analyst for the West Riding of Yorkshire, the City of Sheffield, etc. Third edition, rewritten and enlarged. Volume III., Part I. Tannins, Dyes and Coloring Matters, and Writing Inks. Revised and edited by J. Merritt Matthews, Ph.D., Professor of Chemistry and Dyeing in the Philadelphia Textile School. Philadelphia: P. Blackiston's Son & Co., 1900. pp. 589. Price $4.50.

Since the last edition of the volume of Allen's "Organic Analysis," in which the dyes are described was published, a great many new dyes have been put on the market, which have to a great extent displaced those used most extensively ten years or more ago. As a result, this new edition of the third volume is to a large degree a new book. The space devoted to dyes and coloring matters has been nearly doubled, and extensive tables are given, which are exceedingly valuable in the identification of unknown dyes. The chapter on tannin has been rewritten, and contains a full account of new tanning materials and the methods of analysis which have been recently proposed. Eight pages are given up to a description of the methods for the preparation and identification of commercial inks. As a whole, the work of the American editor, upon whom fell a large part of the revision, has been well done. The book will no doubt continue to prove of as great value as it has done in the past. The printer has carelessly used two kinds of paper in making up the book. J. F. N.

DYNAMO ELECTRIC MACHINERY: ITS CONSTRUCTION, DESIGN, AND OPERATION

By Samuel Sheldon. New York: D. Van Nostrand Company.

Direct current machines only are discussed in this compact volume of 276 pages. The introductory chapters on electric and

magnetic laws and facts are very short, as they should be in a work whose readers take such matters for granted. The ten following chapters deal with the construction, operation, and management of present types of dynamos and motors. It is worthy of mention that the illustrations are wholly of recent American apparatus. The two chapters on motors, though brief, are unusually comprehensive and up to date.

Two chapters on design and tests complete the work. In these, however, condensation has been carried so far that the student or general reader will need considerable assistance in mastering their contents, efficiency tests, for example, being compressed into four pages.

Altogether, the book is an excellent one.

HISTORY OF MARYLAND

By L. Magruder Passano, Instructor in Mathematics, Massachusetts Institute of Technology. Written especially for use in public and private schools. Baltimore: W. J. C. Dulancy Company, 1900. 245 pages.

This volume has been written by Mr. Passano, a native of Maryland and graduate of Johns Hopkins, in response to the law requiring the teaching of the history of the State in the public schools. Aside from its general excellence, the book is marked by one or two features which merit special attention and consideration. In the first place, without slighting the political and military history of the State, the author has presented, in a fuller and more satisfactory manner than is usually the case, social and economic history; and, secondly, the illustrations are almost never fanciful or legendary, but are of a real historical nature, such as portraits, maps, monuments, public buildings, and the like. Several valuable appendixes complete what ought to prove a most instructive work to those for whom it is intended.

AIR, WATER, AND FOOD FROM A SANITARY STANDPOINT

By Ellen H. Richards and Alpheus G. Woodman, Instructors in Sanitary Chemistry, Massachusetts Institute of Technology. 8vo, pp. 226. Illustrated. New York: John Wiley & Sons. London: Chapman & Hall. 1900.

The "standpoint" from which the "three essentials of human existence" which form the subject of this treatise are viewed forcibly expresses the limitations of this work: "Clean air, safe water, and good food" are its bone and sinew. What these are, the importance of their maintenance and how to maintain them, and their requirements by individuals and communities as necessary means for the maintenance of health, are described in practical detail.

After a brief general introduction, thirty-three pages are devoted to the study of the atmosphere, its general composition, usual contaminations, methods of ventilation, and methods of air analysis from the sanitary standpoint. Then follow, in seventy-eight pages, three chapters on water, in which many subjects besides those of analysis are discussed. Chapter V. is supposed to be written from the "Householder's Standpoint," and Chapter VI. from that of the chemist; but both may be read with interest and profit by persons who are not chemists, and who have had no training in chemistry beyond that given in ordinary college courses. Chapter VII. contains a good collection of analytical methods, and from the well-known experience of the authors in these matters it will prove valuable to those employed either as teachers of sanitary chemistry or as practical analysts.

The following seventy-five pages of the book deal with questions of food and partly from the popular standpoint. Many pertinent suggestions are made on the adulteration of common articles, and in the last chapters analytical methods are given by which the practical purity or value of a number of products may be determined.

Tables are appended as follows: I. Tension of aqueous vapor in millimetres of mercury from 0° to 30.9° C., reduced to 0° and sea-level. II. Weight of a cubic centimetre of carbon-dioxide

from 746 to 778 millimetres pressure and from 10° to 25° C. Corrected from the tension of aqueous vapor. III. Average composition of waters. Based on Massachusetts data. IV. Normal waters from various parts of North America. V. Sewage and polluted waters. VI. Mineral contents of some natural waters. VII. Hardness, showing the parts of calcium carbonate ($CaCo_2$) in one million for each tenth of a cubic centimetre of soap solution used. VIII. Showing the number of cubic centimetres of oxygen dissolved in one thousand cubic centimetres of water when saturated at different temperatures, as calculated by Winkler. IX. For correcting the specific gravity of milk according to temperature. Adapted from the table of Vieth. X. Percentage of alcohol by weight from the specific gravity at 15.5° C.

THE THEORY OF ELECTROLYTIC DISSOCIATION

By Harry C. Jones, Ph.D. 289 pp. New York: The Macmillan Company. Price $1.60.

The aim of this little work is to present in a connected form the investigations which lead up to, and upon which the electrolytic dissociation theory of Arrhenius is based. The book will be welcome to a large class of readers who desire some knowledge of the more recent developments in physical chemistry, but who have not the time or opportunity for consulting the original literature of the subject.

The matter is presented in historical sequence, and the essential arguments and results of the various investigations are in many cases translated literally from the original papers,— a feature of the work which puts the reader into close touch with the scientists who originated and developed the theory. Particularly is this true in the case of vant Hoff's discovery of the relation between osmotic pressure and gaseous pressure, where we have a translation of a delightful lecture by vant Hoff himself on "How the Theory of Solutions arose."

A rather lengthy introductory chapter on the state of physical chemistry, prior to 1885, is followed by the work of Pfeffer on

osmotic pressure, of vant Hoff on the theory of solutions, and of Arrhenius on the dissociation theory. A long chapter follows on the evidence deduced in favor of the theory, and a chapter on some of its numerous applications, among others Nernst's theory of the Voltaic cell, concludes the work. The chief criticism one would make is a one-sidedness of the work, resulting from the failure of the author, who is an enthusiastic advocate of the theory, to discuss with the great mass of evidence supporting the theory the various objections which have been raised to it, and difficulties which it still fails to explain. The importance of the theory would lose nothing by such a critique; for in its present form the theory has already helped to clear up more questions, in both physics and chemistry, than any other theory proposed during the last decade.

H. M. Goodwin.